ANDREW

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s · Towers · Microwave Antennas · HF Antennas · Earth Station Antennas · Broadcast Antennas · Specialized Antennas · Radar and Navaid Antennas · Optical Fiber · Pressuri

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ANDREW

Microwave Antenna System Computer and Transmission Line Selector

Microwave Antenna System Computer

Beam Characteristics. To find the gain, beamwidth and side lobe positions for a parabolic antenna, move the slide so that the operating frequency on the **f** scale is over the antenna diameter on the **D** scale. Gain will appear under the arrow on the **G** scale. Beamwidth, in degrees, will appear on the ψ scale under the arrows of the **.5P** and **.8P** indices, and the position of the first and second side lobe maxima, in degrees, will appear on the ψ scale under the arrows of the **SIDE LOBE MAX.** index. For example, to find beam characteristics for a 6 GHz antenna 4 ft. in diameter, move slide until 6 on **f** scale is over 4 on **D** scale. Gain is 35.1 on **G** scale when efficiency at aperture is 55%. Half power beamwidth (total angle) between the 3 dB points is 2.85°, as indicated on the ψ scale under the **.5P** index. The 80% power beamwidth between the 1 dB points is 1.65°, as indicated on the ψ scale under the **.8P** index. The first and second side lobe maxima are 4.8° and 7.2° from the main beam, respectively, as indicated under the appropriate arrows of the **SIDE LOBE MAX.** index on the ψ scale.

Free Space Attenuation. For a given operating frequency on the **f** scale, and distance in miles between stations on the **M** scale, free space attenuation between two isotropic antennas is found on the **A** scale. For example, to determine free space attenuation between two 6 GHz isotropic antennas 30 miles apart, move slide until 6 on **f** scale is over 30 on **M** scale. Free space attenuation is 141.7 dB, as indicated on the **A** scale. Net path loss is obtained by subtracting the combined gain of the antennas from the free space attenuation figure. For example, if two 4 ft. antennas with 35.1 dB gain are used, net path loss is obtained by subtracting the combined gain of the antennas (2 x 35.1 dB) from the free space attenuation figure of 141.7 dB, for a net loss of 71.5 dB, since 141.7 dB — (2 x 35.1 dB) = 71.5 dB. For distances beyond ranges indicated on **M** scale, a scale factor of 10, 100, 1000 or 10,000 is used while adding differential(s) of 20, 40, 60 or 80 to the figure on **A** scale. The table below shows scale factor versus added differentials. For example, if two 6 GHz antennas are 100,000 miles apart, use a scale factor of 1000 and move slide until 6 on **f** scale is over 100 on **M** scale. 152.2 dB will appear on **A** scale. A 60 dB differential is used with a scale factor of 1000, and is added to the 152.2 dB for a total free space attenuation value of 212.2 dB.

Scale Factor	Differential (Add to Figure on A Scale)
10	20 dB
100	40 dB
1000	60 dB
10000	80 dB

Tropospheric Forward "Scatter" Propagation Attenuation is obtained by adding the free space attenuation value from **A** scale and the "tropo scatter" loss value from **S** scale below distance value on **M** scale. For example, if two 6 GHz antennas are 100 miles apart, move slide until 6 on **f** scale is over 100 on **M** scale. Free space attenuation is 152.2, as indicated on **A** scale. An **S** scale value of 60 dB appears below 100 index on **M** scale and is added to the 152.2 dB for a total "tropo scatter" propagation attenuation value of 212.2 dB.

Equivalent Noise Input (ENI) of Receiver is determined by moving slide until known bandwidth value on **B** scale is above known receiver noise figure on **NF** scale. The **N** scale will indicate receiver ENI in dB. For example, if bandwidth is 30 MHz and receiver noise figure is 12 dB, move slide until 30 on **B** scale is above 12 on **NF** scale and an ENI value of —87.5 dBm is under arrow **N**.

Equivalent Thermal Noise Power of System Components is determined by moving the slide until known frequency value on **B** scale appears over known temperature value in kelvins on **T** scale. Equivalent thermal noise power value will appear under arrow on **N** scale. For example, if a 20 MHz system is generating 627° K, move slide until 20 MHz on **B** scale is over 627 on **T** scale. Equivalent thermal noise power is —97.6 dB, as indicated by arrow on **N** scale.

Reflection Coefficient (Γ) and Return Loss are calculated from a known VSWR value by moving slide until value on ρ scale is under top arrow. Reflection coefficient (Γ) will be over top arrow and return loss value in dB will appear over bottom arrow. For example, if known VSWR is 1.1, move slide until 1.1 on ρ scale is under arrow. Reflection coefficient of 0.048 is over arrow on Γ scale and 26.4 dB is over arrow on **RETURN LOSS** scale.

System Calculation. To determine required size and gain of two antennas 20 miles apart, operating at 6 GHz, transmitting at 1 watt, with a 20 MHz bandwidth, a receiver noise figure of 15 dB and a carrier-to-noise (C/N) ratio of 45 dB, proceed as follows:

(1) Determine free space attenuation by moving slide until 6 on **f** scale is over 20 on **M** scale and **A** scale indicates attenuation of 138.2 dB.

(2) Determine ENI by moving slide until 20 MHz on **B** scale is over 15 dB on **NF** scale. ENI is —86.1 dBm, as indicated by arrow on **N** scale.

(3) Since the signal is transmitted at 1 watt (30 dBm) and attenuation is 138.2 dB, the received signal is —108.2 dBm, or 22.1 dB below noise. For a C/N ratio of 45 dB, total antenna system gain ($G_T + G_R$) must be greater than or equal to 22.1 dB + 45.0 dB, or 67.1 dB; therefore, each antenna must have a minimum gain of 33.55 dB. Move slide until **G** scale indicates 33.55 dB. Refer to **f** scale and **D** scale. At 6 GHz, the smallest antenna with adequate gain would be 3.5 ft in diameter, although the smallest Andrew standard antenna for 6 GHz is 4 ft in diameter with 35.1 dB gain.

MICROWAVE ANTENNA SYSTEM COMPUTER

WAVELENGTH in I — 500 400 300 200 150 100 80 60 50 40 30 25 20 15 10 8 6 5 4 3 2 1.5 1 .8 .6 .5 .4 .3

WAVELENGTH cm c — 1K 800 600 500 400 300 200 150 100 80 60 50 40 30 25 20 15 10 8 6 5 4 3 2 1.5 1 .8 .7

FREQUENCY GHz f — .03 .04 .06 .08 .1 .2 .3 .4 .5 .6 .8 1 2 3 4 5 6 8 10 20 30 40

DIAMETER Feet D

DISTANCE Miles M — 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1½ 1 ¾ ½

"TROPO-SCATTER" LOSS S
OVER FREE SPACE ATTEN. — 100 90 80 70 60 50 40 (dB)

SIDE LOBES AND BEAM WIDTH — 2nd SIDE LOBE MAX. 1st .5P O U .8P

ANGLE ψ — 0 10 8 6 5 4 3 2

GAIN dB G — 25 30 35 40

EFFICIENCY % g — 20 30 40 50 60 80 100 S

FREE SPACE ATTENUATION A — dB — 115 120 125

REFLECTION COEFFICIENT $|\Gamma|$ — .01 .015

VSWR ρ — 1.02 1.03

RETURN LOSS dB — 40 38 36

EQUIVALENT NOISE INPUT OF RECEIVER N (−dBm) — 100 95 90 85 80 75 70

BANDWIDTH B — Hz .3 .5 1 MHz 3 5 10 MHz 30 50 100 MHz 500 1000

NOISE TEMP., T, IN K — 3x10⁴ 10⁴ 5x10³ 10³ 500 200 100 50 30 20 10 5 3

NOISE FIGURE NF dB — 20 15 10 5 4 3 2 1 .5 .3 .2 .1 .05

$NF(dB) = 10 \log (\frac{T}{T_o} + 1), T_o = 290°K$

HELIAX® ELLIPTICAL WAVEGUIDE

Recommended for Operating Bands in Frequency Range - GHz	Andrew Type Number	Bending Radius - in.		Attenuation - dB per 100 feet					
		E Plane	H Plane	Freq. GHz	Atten.	Freq. GHz	Atten.	Freq. GHz	Atten.
1.7 - 2.3	EW17, EWP17	28	81	1.7	0.46	2.0	0.36	2.3	0.33
2.5 - 2.7	EW20	26	71	2.5	0.44	2.6	0.43	2.7	0.42
2.9 - 3.4	EW28	22	52	2.9	0.68	3.1	0.62	3.4	0.57
3.1 - 4.2	EW34, EWP34	14	38	3.4	0.73	3.7	0.68	4.2	0.64
3.4 - 4.2	EW37, EWP37	17	41	3.7	0.92	3.95	0.84	4.2	0.79
4.4 - 5.0	EW44, EWP44	15	32	4.4	1.38	4.7	1.22	5.0	1.12
4.4 - 5.0	EWS44	7	16	4.4	1.71	4.7	1.49	5.0	1.36
5.6 - 6.425	EW52, EWP52	12	32	5.925	1.21	6.175	1.18	6.425	1.16
5.925 - 7.125	EW63, EWP63	10	29	6.425	1.40	6.775	1.35	7.125	1.32
7.125 - 7.750	EW64, EWP64	10	27	7.125	1.48	7.450	1.46	7.750	1.43
7.125 - 8.5	EW77, EWP77	9	25	7.125	1.91	7.750	1.79	8.500	1.70
8.5 - 9.8	EW85	8	19	8.5	3.45	9.25	3.1	9.8	2.93
10.5 - 11.7	EW90, EWP90	7	19	10.7	3.14	11.2	3.06	11.7	3.00
11.7 - 13.25	EW127A, EWP127A	6	15	12.2	3.63	12.7	3.55	13.25	3.47
14.0 - 15.35	EW132	5	14	14.4	4.88	14.9	4.78	15.35	4.70
17.7 - 19.7	EW180	6	15	17.7	6.13	18.7	5.91	19.7	5.75
21.2 - 23.6	EW220	4	9	21.2	8.82	22.4	8.60	23.6	8.45

Side 1

ANTENNA TYPE — SHIELDED ANTENNA W/PLANAR RADOME; HORN—REFLECTOR ANTENNA W/RADOME; PARABOLIC ANTENNA W/O RADOME; PARABOLIC ANTENNA W/FIBERGLASS RADOME; GRID ANTENNA

WIND VELOCITY mph — 20 30 40 50 60 70 80 90 100 150 200

MAXIMUM THRUST lb — 50 100 200 300 500 1000 2000 3000 5000 10000 20

ANTENNA DIA. ft — 2 3 4 5 6 7 8 9 10 12 14 16 18 20 25 30

ANDREW

 · Form E8525C (5/92)

COAXIAL TRANSMISSION LINE SELECTOR

FREQUENCY 150 MHz

Type	Nom. Size Inches	Andrew Type No.	Imped. ohms	Weight lb/ft	Bending Radius Inches	Velocity Percent	Atten.* dB per 100 ft	Average Power**	Peak Power kW***
FOAM DIELECTRIC HELIAX® COAXIAL CABLE	⅜	LDF2-50	50	0.08	3.75	88.0	1.3	.92	8
	½	LDF4-50A	50	0.16	5	88.0	.85	1.52	19
	⅞	LDF5-50A	50	0.33	10	89.0	.458	4.34	44
	1¼	LDF6-50	50	0.66	15	89.0	.340	7.50	90
	1⅝	LDF7-50A	50	0.92	20	88.0	.280	10.8	145
SUPERFLEXIBLE	¼	FSJ1-50	50	0.06	1.0	78.0	2.29	.57	5
	½	FSJ4-50B	50	0.14	1.25	81.0	1.29	1.65	7.5
AIR DIELECTRIC HELIAX® COAXIAL CABLE	½	HJ4-50	50	0.24	5	91.4	1.02	1.71	10
	⅝	HJ4.5-50	50	0.4	7	92.0	.602	3.41	20
	⅞	HJ5-50	50	0.54	10	91.6	.46	5.1	44
	1⅝	HJ7-50A	50	1.04	20	92.1	.252	11.7	145
	2¼	HJ12-50	50	1.16	22	93.1	.209	16.2	210
	3	HJ8-50B	50	1.78	30	93.3	.178	29.5	320
	4	HJ11-50	50	2.50	40	92.0	.140	45	490
	5	HJ9-50	50	3.30	50	93.0	.098	59	765
RIGID LINES	1⅝	561	50	1.35	—	99.8	.240	12	145
	3⅛	MACX350	50	3.0	—	99.7	.127	47	500
	4¹⁄₁₆	MACX450	50	5.6	—	99.7	.087	74	750
	6⅛	MACX650	50	7.3	—	99.7	.062	158	1500
	6⅛	MACX675	75	6.75	—	99.8	.058	138	1000

ANDREW

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Andrew Canada, Inc.
Whitby, Ontario, Canada

Andrew GmbH
Kommunikationssysteme
Essen, Germany

Andrew
Kommunikationssysteme AG
Zurich, Switzerland

Andrew International
Corporation
Tokyo, Japan

Andrew Corporation
Mexico S.A. de C.V.
Mexico, D.F. Mexico

Andrew España, S.A.
Madrid, Spain

Andrew Antennas
Wokingham, Berkshire
United Kingdom

Andrew S.R.L.
Milan, Italy

Antennas Andrew S.A.R.L.
Buc, France

Andrew Antennas
Victoria, Australia

* VSWR 1.0, ambient temperature 24°C (75°F), atmospheric pressure, dry air.
** VSWR 1.0, ambient temperature 40°C (104°F), atmospheric pressure, dry air.
Inner Conductor Temperatures:
HJ8 and HJ11 121°C (250°F)
Other HELIAX 100°C (212°F)
Rigid Lines 102°C (216°F)
Atmospheric pressure, dry air
*** Derate peak power ratings by 4 for 100% AM, by 5.06 for 125% AM.

EFFICIENCY % E — 50 60 70 80 85

ATTENUATION dB/100 ft α — 10 9 8 7 6 5 4 3 2 1.0 .8 .6 .5 .4 .3 .2 .1 .08 .06 .05 .04 .03 .02

LENGTH Feet L — 10 15 20 30 40 50 60 80 100 150 200 300 400 600 800 1000 2000 3000 5000

CABLE SIZE Inches — 5 4 3 2¼ 1⅝ 1¼ ⅞ ⅝

AVERAGE POWER DERATING FACTORS

for VSWR = 1.5 — 1.50 1.45 1.40 1.35 1.30 1.25 1.20 1.15 1.10 1.09 1.085 Min. Value

FREQUENCY MHz — 3 4 5 6 8 10 15 20 30 40 50 60 80 100 150 200 300 400 500 600 800

for VSWR = 2.0 — 2.00 1.95 1.90 1.80 1.70 1.60 1.50 1.40 1.30 1.25 Min. Value

Side 2

Passive Repeaters are used between end points of an antenna system to redirect microwave beams over or around obstacles. Passive repeaters may consist of back-to-back parabolic antennas or flat reflectors. System calculations for both types of passive repeaters are discussed below.

System calculations for systems using back-to-back parabolic antennas as passive repeaters are the same as those given in the direct point-to-point microwave **System Calculation** paragraph, except total attenuation is the sum of the attenuation of both legs of the system. The sum of the gain of all four antennas should also be greater than or equal to the total gain required.

System calculations for systems using flat reflector passive repeaters are also the same as those given in the direct point-to-point microwave **System Calculation** paragraph, except for gain and beamwidth. Gain for flat reflectors varies according to the shape of the reflector's projected area and is counted twice, since the reflector receives and transmits the beam. To determine flat reflector gain, move slide until system operating frequency on the **f** scale is over the reflector's diameter, or widest projected dimension, on the **D** scale. Gain for flat reflectors with a circular projected area is indicated above the **100** index on the **g** scale, and the total angle between the 3 dB points of the main beam is indicated below the **O** index on the ψ scale. Gain for flat reflectors with a square projected area is indicated above the **S** index on the **g** scale, and the total angle between the 3 dB points of the main beam is indicated below the **U** index on the ψ scale. To determine gain and beamwidth for reflectors with a rectangular projected area, move slide until operating frequency on **f** scale is over the same dimension on the **D** scale as for a square reflector of equal area. Gain is indicated above the **S** index on the **g** scale. To determine total angle between the 3 dB points, move slide so that the operating frequency on the **f** scale is over the actual horizontal dimension on the **D** scale. Total angle between the 3 dB points is indicated below the **U** index on the ψ scale.

Maximum Wind Thrust is determined by moving slide until wind velocity value is under antenna type index. The corresponding maximum thrust value will be above the antenna diameter figure. For example, to determine maximum wind thrust on a 12 ft shielded antenna in a 125 mph wind, move slide until 125 mph on **WIND VELOCITY** scale is under **HIGH PERFORMANCE ANTENNA W/PLANAR RADOME** index. A maximum thrust value of 5800 lbs will be over the 12 ft index on **ANTENNA DIA.** scale. If shielded antennas are used without planar radomes, maximum force is approximately the same as for parabolic antennas without radomes.

HELIAX® Elliptical Waveguides are listed by operating frequency in the chart in the lower right hand corner. Attenuation at low, mid and high band ranges and minimum E and H plane bending radii are also listed.

Transmission Line Selector

HELIAX® Coaxial Cable and Rigid Transmission Line Selector. To determine line size or type when frequency and power requirements are known, move slide until desired frequency appears in top **FREQUENCY** window. Attenuation and average power ratings will appear on the cable selection chart. Select cable accordingly.

Derating Factor for Average Power Rating versus VSWR. To determine a derating factor for a cable of known size and VSWR, move slide until cable size appears under **CABLE SIZE** window. Derating factor will be on appropriate VSWR scale across from cable operating frequency on **FREQUENCY** scale.

Transmission Line Efficiency. To determine transmission line efficiency, move slide until attenuation value for the selected cable type on the α scale lines up with proposed system length on the **L** scale. System efficiency rating will be under arrow on **E** scale.

System Calculation. To select a transmission line for a system 210 ft long with VSWR of 1.5 and transmitter power of 10 kW at 100 MHz, refer to cable selection chart and move slide until 100 MHz appears in top **FREQUENCY** window. Select Type HJ7A HELIAX air-dielectric cable after reading 14.4 kW on average power column of chart. Then refer to **AVERAGE POWER DERATING FACTORS** scale and move slide until 1-5/8 appears in **CABLE SIZE** window. A derating factor of 1.24 will be on 1.5 VSWR scale across from 100 MHz on **FREQUENCY** scale. Divide original average power rating of 14.4 by the 1.24 derating factor for corrected average power rating of 11.6 kW. To determine system efficiency, move slide until attenuation value of 0.207 on α scale is over 210 on **L** scale. An efficiency rating of 90.6% will be under arrow on the **E** scale.

ANDREW

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Andrew GmbH
Kommunikationssysteme
Essen, Germany

Andrew S.R.L.
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Wokingham, Berkshire,
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Kommunikationssysteme A.G
Zurich, Switzerland

Form E8525C

7/92
Printed in U.S.A.

ANDREW

U.S. Price List

For Catalog 33

Effective 1 September 1987

Supersedes previous prices
All prices in U.S. dollars

ANDREW
1-800-255-1479
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Customer Support Center

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Andrew Corporation
10500 W. 153rd Street, Orland Park, IL 60462

ANDREW

New Products

The products listed below are new and not described in Catalog 33. For further information on these products, call 1-800-255-1479.

ANDREW
1-800-255-1479
CSC Line
Customer Support Center

Microwave Antennas

Type No.	Description	Price	F.O.B.
UHP8-18	8 ft. UHP Antenna, 1.85-1.99 GHz	$ 9,370.00	D
UHP8F-18	8 ft. UHP Antenna, 1.85-1.99 GHz	9,370.00	D
UHP10-18	10 ft. UHP Antenna, 1.85-1.99 GHz	11,400.00	D
UHP10F-18	10 ft. UHP Antenna, 1.85-1.99 GHz	11,400.00	D
UHP12-18	12 ft. UHP Antenna, 1.85-1.99 GHz	15,800.00	D
UHP12F-18	12 ft. UHP Antenna, 1.85-1.99 GHz	15,800.00	D
UHX8-21	8 ft. UHX Antenna, 2.1-2.2 GHz	10,800.00	D
UHX10-21	10 ft. UHX Antenna, 2.1-2.2 GHz	12,950.00	D
UHX12-21	12 ft. UHX Antenna, 2.1-2.2 GHz	17,700.00	D
UHX10X-65	10 ft. UHX Antenna, 6.425-7.125 GHz	14,150.00	D
HP6-71W	6 ft. High Perf. Antenna, 7.125-8.4 GHz	6,230.00	D
HP8-71W	8 ft. High Perf. Antenna, 7.125-8.4 GHz	8,260.00	D
HP10-71W	10 ft. High Perf. Antenna, 7.125-8.4 GHz	10,100.00	D
HXPD6-144	6 ft. High XPD Antenna, 14.4-15.35 GHz	On App.	D
HXPD8-144	8 ft. High XPD Antenna, 14.4-15.35 GHz	On App.	D
P8-186	8 ft. Standard Antenna, 2/6.5 GHz	5,620.00	D
P10-186	10 ft. Standard Antenna, 2/6.5 GHz	6,540.00	D

Microwave Waveguides

Type No.	Description	Price	F.O.B.
163DEP-1	Pre-Tuned Connector, EWP63	225.00	O
56045-90	Field Flange, CPR90G	112.00	O
56045-112	Field Flange, CPR112G	112.00	O
56045-137	Field Flange, CPR137G	112.00	O
56045-159	Field Flange, CPR159G	112.00	O
56045-187	Field Flange, CPR187G	180.00	O
56045-229	Field Flange, CPR229G	210.00	O
62831-144	Two Way Power Divider, WR62	600.00	O
62832-122	Two Way Power Divider, WR75	600.00	O
62832-127	Two Way Power Divider, WR75	600.00	O
62833-107	Two Way Power Divider, WR90	600.00	O
62834	Two Way Power Divider, WR112	600.00	O
62835-59	Two Way Power Divider, WR137	600.00	O
62835-64	Two Way Power Divider, WR137	600.00	O
62837-44	Two Way Power Divider, WR187	700.00	O
62842-107	Two Way Power Divider, WR90	600.00	O
62843-71	Two Way Power Divider, WR112	600.00	O
62844-59	Two Way Power Divider, WR137	600.00	O
62844-64	Two Way Power Divider, WR137	600.00	O
62845-59	Two Way Power Divider, WR159	670.00	O
62846-44	Two Way Power Divider, WR187	700.00	O
62847-37	Two Way Power Divider, WR229	700.00	O

HELIAX® High Temperature Foam Cables

Type No.	Description	Price	F.O.B.
FT4-50	½″ High Temp. Foam Cable, unjacketed	6.70/ft.	O
FT4-50T	½″ High Temp. Foam Cable, jacketed	8.90/ft.	O
FT5-50	⅞″ High Temp. Foam Cable, unjacketed	11.20/ft.	O
FT5-50T	⅞″ High Temp. Foam Cable, jacketed	19.00/ft.	O

HELIAX Air-Dielectric Cables

Type No.	Description	Price	F.O.B.
HJ4-75	½″ Air-Dielectric Cable, 75 ohm	$ 3.02/ft.	O
41690-51	Fire-Retardant Jacketed HJ4-75	3.62/ft.	O
74AW-70	N Plug (male), HJ4-75	98.00	O
HJ12-50	2¼″ Air-Dielectric Cable	17.00/ft.	O
41690-52	Fire-Retardant Jacketed HJ12-50	20.00/ft.	O
207760	2¼″ Air Cable, 824-894 MHz	17.00/ft.	O
207761	2¼″ Air Cable for Broadcast	175.00 + 19.00/ft.	O
82N	N Jack (female), HJ12-50	250.00	O
82R	1⅝″ EIA Flange, HJ12-50	260.00	O
82Z	Splice, HJ12-50	340.00	O
33948-6	Insulated Hanger, 2¼″ Cable	40.00	O
40656-6	Wall/Roof Feed Thru, 2¼″ Cable	84.00	O

HELIAX Cable Connectors, Other

Type No.	Description	Price	F.O.B.
L42EN	N Jack (female), LDF2-50	54.00	O
L42ENT	TNC Jack (female), low VSWR, LDF2-50	62.50	O
L42EW	N Plug (male), LDF2-50	54.00	O
L42EWT	TNC Plug (male), low VSWR, LDF2-50	62.50	O
41SCM	CATV "F" (male), FSJ1-75	20.00	O
41SW-75	N Plug (male), FSJ1-75	9.40	O
44ASCM	CATV "F" (male), FSJ4-75A	30.00	O
49651	BNC Plug (male), FSJ1-75	36.50	O

HELIAX Cable Accessories, Other

Type No.	Description	Price	F.O.B.
34767A-44	Connector Reattachment Kit, 75ART, AGT	22.00	O
34767A-46	Connector Reattachment Kit, 82N	15.00	O
34767A-47	Connector Reattachment Kit, 82R	15.00	O
48939-6	Cable Boot, 5″, ½″ Foam Cable	65.00	O
48939-7	Cable Boot, 5″, ½″ Air Cable	65.00	O
48939-8	Cable Boot, 5″, 3 Openings, ½″ Foam	65.00	O
204679-5	Cable Boot, 4″, ½″ Foam Cable	65.00	O
204679-6	Cable Boot, 4″, ½″ Air Cable	65.00	O
204679-7	Cable Boot, 4″, 3 openings, ½″ Foam	65.00	O
206929-1	Tower/Hanger Adaptor, 1 run	On App.	O
206929-4	Tower/Hanger Adaptor, 4 runs	On App.	O
206929-8	Tower/Hanger Adaptor, 8 runs	On App.	O
206930	J-Bolt Hardware Kit	On App.	O
207030	Cluster Mount	On App.	O

RADIAX® Slotted Coaxial Cables

Type No.	Description	Price	F.O.B.
RXL6-1	1¼″ Cable, Standard Jacket	9.75/ft.	O
RXL6-1R	1¼″ Cable, Fire-Retardant Jacket	11.25/ft.	O
RXL7-1	1⅝″ Cable, Standard Jacket	13.25/ft.	O
RXL7-1R	1⅝″ Cable, Fire Retardant Jacket	15.25/ft.	O
43042-2	2″ Standoff Kit of 10, Use with Hanger Kit	55.00	O
42396A-1	Hanger Kit of 10 for 1¼″ Cable	38.00	O
42396A-2	Hanger Kit of 10 for 1⅝″ Cable	38.00	O

O F.O.B. Orland Park, Illinois   D F.O.B. Denton, Texas

Supplement to U.S. Price List
For Catalog 33

ANDREW
Andrew Corporation
10500 West 153rd Street
Orland Park, IL 60462

Effective 15 April 1988 and supersedes previous prices

This Supplemental Price List contains revisions of selected products. Consult U.S. Price List 2060 — effective 1 September 1987 for prices of other products not listed herein.

Consult page 51 of U.S. Price List 2060 for a complete statement regarding pricing terms and conditions of sale, which are incorporated herein by this reference.

Bulletin 5201

EW

Type No.		Price	Page	F.O.B.
EW17		29.80/ft.	188	O
EW20		24.30/ft.	188	O
EW28		21.70/ft.	188	O
EW34		19.40/ft.	188	O
EW37		17.80/ft.	188	O
EW44		15.50/ft.	188	O
EW52		14.40/ft.	188	O
EW63		12.55/ft.	189	O
EW64		12.50/ft.	189	O
EW77		12.40/ft.	189	O
EW85		11.00/ft.	189	O
EW90		11.30/ft.	189	O
EW127A		10.10/ft.	189	O
EW132		10.10/ft.	189	O
EW180		8.15/ft.	189	O
EW220		7.90/ft.	189	O

EWP

Type No.		Price	Page	F.O.B.
EWP17		31.60/ft.	186	O
EWP34		21.00/ft.	186	O
EWP37		19.60/ft.	186	O
EWP37S		20.60/ft.	185	O
EWP44		16.90/ft.	186	O
EWP52		16.00/ft.	186	O
EWP52S		17.00/ft.	185	O
EWP63		13.95/ft.	187	O
EWP63S		14.95/ft.	185	O
EWP64		13.85/ft.	187	O
EWP77		13.60/ft.	187	O
EWP90		12.50/ft.	187	O
EWP90S		13.50/ft.	185	O
EWP127A		11.40/ft.	187	O
EWP132		11.40/ft.	187	O
EWP180		9.20/ft.	187	O
EWP220		8.90/ft.	187	O
EWS44		21.00/ft.	188	O

FH

Type No.		Price	Page	F.O.B.
FHJ1-50		1.11/ft.	222	O
FHJ5-75		5.00/ft.	228	O

FS-FT

Type No.		Price	Page	F.O.B.
FSJ1-50		1.28/ft.	222	O
FSJ1-75		1.28/ft.	222	O
FSJ4-50B		2.88/ft.	224	O
FSJ4-75A		2.88/ft.	224	O
FT4-50		7.00/ft.	N	O
FT4-50T		9.30/ft.	N	O
FT5-50		11.70/ft.	N	O
FT5-50T		19.90/ft.	N	O

HJ

Type No.		Price	Page	F.O.B.
HJ4-50		3.22/ft.	232	O
HJ4-75		3.22/ft.	N	O
HJ5-50		5.94/ft.	234	O
HJ5-75		5.94/ft.	234	O
HJ5P-50		6.84/ft.	234 242	O
HJ7-50A		12.78/ft.	236	O
HJ7-75		12.78/ft.	236	O
HJ7P-50A		14.50/ft.	236 242	O
HJ7SP-50A		15.00/ft.	236 242	O
HJ8-50B		23.50/ft.	238	O
HJ9-50		37.20/ft.	238	O
HJ11-50		25.60/ft.	238	O
HJ12-50		18.00/ft.	N	O

HT

Type No.		Price	Page	F.O.B.
HT4-50		6.60/ft.	232	O
HT5-50		12.15/ft.	232	O

L

Type No.		Price	Page	F.O.B.
L42EN	#1	57.00	N	O
L42ENT	#1	66.50	N	O
L42EW	#1	57.00	N	O
L42EWT	#1	66.50	N	O
L42N	#1	27.70	225	O
L42NT	#1	55.00	225	O
L42P	#1	35.00	225	O
L42U	#1	35.00	225	O
L42W	#1	27.70	225	O
L42WT	#1	55.00	225	O
L44DF	#1	122.00	227	O
L44DM	#1	83.00	227	O
L44EN	#1	56.00	227	O
L44EW	#1	56.00	227	O
L44F	#1	108.00	227	O
L44J	#1	90.00	227	O
L44M	#1	90.00	227	O
L44N	#1	25.20	227	O
L44N-70	#1	35.00	227	O
L44N-75	#1	29.00	227	O
L44P	#1	22.20	227	O
L44P-75	#1	28.00	227	O
L44R	#1	90.00	227	O
L44T	#1	100.00	227	O
L44U	#1	22.20	227	O
L44U-75	#1	28.00	227	O
L44W	#1	25.20	227	O
L44W-70	#1	35.00	227	O
L44W-75	#1	29.00	227	O
L44Z		87.00	227	O
L45DF	#1	143.00	229	O
L45DM	#1	94.00	229	O
L45F	#1	112.00	229	O
L45J	#1	138.00	229	O
L45L	#1	128.00	229	O
L45M	#1	128.00	229	O
L45N	#1	61.80	229	O
L45P	#1	58.80	229	O
L45R	#1	94.00	229	O
L45T	#1	117.00	229	O
L45U	#1	58.80	229	O
L45W	#1	61.80	229	O
L45Z		104.00	229	O
L46DF	#2	205.00	231	O
L46DM	#2	160.00	231	O
L46F	#2	170.00	231	O
L46L	#2	194.00	231	O
L46M	#2	194.00	231	O
L46N	#2	104.00	231	O
L46R	#2	177.00	231	O
L46S	#2	177.00	231	O
L46W	#2	104.00	231	O
L46Z		190.00	231	O
L47DF	#2	275.00	231	O
L47DM	#2	255.00	231	O
L47F	#2	240.00	231	O
L47L	#2	250.00	231	O
L47M	#2	250.00	231	O
L47N	#2	197.00	231	O
L47R	#2	225.00	231	O
L47S	#2	265.00	231	O
L47Z		250.00	231	O

LDF

Type No.		Price	Page	F.O.B.
LDF2-50		1.47/ft.	224	O
LDF4-50A		1.92/ft.	226	O
LDF4-75A		1.92/ft.	226	O
LDF4P-50A		2.22/ft.	226 240	O
LDF5-50A		5.00/ft.	228	O
LDF5P-50A		5.75/ft.	228 240	O
LDF6-50		8.62/ft.	230	O
LDF6P-50		9.75/ft.	230 240	O
LDF7-50A		11.80/ft.	230	O
LDF7P-50A		13.10/ft.	230 240	O

RX

Type No.		Price	Page	F.O.B.
RX1-2		1.90/ft.	N	O
RX1-2R		2.24/ft.	N	O
RX4-1		2.68/ft.	259	O
RX4-1R		3.08/ft.	259	O
RX4-2A		3.40/ft.	259	O
RX4-2R		3.88/ft.	259	O
RX4-3A		3.40/ft.	259	O
RX4-3R		3.88/ft.	259	O
RX5-1		5.80/ft.	259	O
RX5-1R		6.65/ft.	259	O
RXL6-1		10.30/ft.	N	O
RXL6-1R		11.90/ft.	N	O
RXL7-1		14.00/ft.	N	O
RXL7-1R		16.20/ft.	N	O

41-45

Type No.		Price	Page	F.O.B.
41EN	#1	68.00	223	O
41ENS	#1	74.00	223	O
41ENT	#1	74.00	223	O
41EW	#1	64.00	223	O
41EWS	#1	72.00	223	O
41EWT	#1	70.00	223	O
41N	#1	36.00	223	O
41P	#1	36.00	223	O
41SCM	#1	21.00	N	O
41SEW	#1	52.00	223	O
41SJ	#1	82.00	223	O
41SN-70	#1	40.00	223	O
41SNS	#1	64.00	223	O
41SP	#1	6.85	223	O
41SW	#1	10.25	223	O
41SW-70	#1	40.00	223	O
41SW-75	#1	18.00	N	O
41SWS	#1	64.00	223	O
41SWT	#1	32.80	223	O
41SWT-75	#1	24.00	223	O
41U	#1	42.00	223	O
41W	#1	36.00	223	O
44AN	#1	29.00	261	O
44AP	#1	27.00	261	O
44ASCM	#1	32.00	N	O
44ASGR	#1	128.00	225	O
44ASJ	#1	82.00	225	O
44ASN	#1	29.00	225	O
44ASN-75	#1	33.20	225	O
44ASP	#1	29.00	225	O
44ASP-75	#1	33.20	225	O
44ASR	#1	105.00	225	O
44ASU	#1	29.00	225	O
44ASU-75	#1	33.20	225	O
44ASW	#1	29.00	225	O
44ASW-75	#1	33.20	225	O
44AU	#1	27.00	261	O
44AW	#1	29.00	261	O
45AN	#1	72.00	261	O
45AN-75	#1	94.00	229	O
45AP	#1	68.00	261	O
45AU	#1	68.00	261	O
45AW	#1	72.00	261	O

74-87

Type No.		Price	Page	F.O.B.
74AN	#1	76.00	233	O
74AW	#1	76.00	233	O
74AW-70	#1	105.00	N	O
74T	#1	150.00	233	O
74U	#1	100.00	233	O
74Z		188.00	233	O
75AG	#1	150.00	233 245	O
75AGT	#1	345.00	243	O
75AM	#1	172.00	233 235	O
75AM-75	#1	250.00	235	O
75AN	#1	78.00	233 235	O
75AN-75	#1	175.00	235	O
75AR	#1	102.00	233 235	O
75AR-75	#1	200.00	235	O
75ART	#1	305.00	243	O
75AT	#1	186.00	233 235	O
75AT-75	#1	260.00	235	O
75AU	#1	82.00	233 235	O
75AU-75	#1	247.00	235	O
75AW	#1	78.00	233 235	O
75AW-75	#1	200.00	235	O
75AZ		115.00	233 235	O
75AZ-75	#1	300.00	235	O
75DM	#1	315.00	233 235	O
75GT		345.00	243	O
75NT		265.00	243	O
75RT		305.00	243	O
75WT		265.00	243	O
78AGF	#2	380.00	239	O
78AGM	#2	390.00	239	O
78ARF	#2	360.00	239	O
78ARM	#2	370.00	239	O
78AS	#2	465.00	239	O
78BZ		460.00	239	O
79AG	#2	1,160.00	239	O
79AR	#2	1,110.00	239	O
79AZ		1,200.00	239	O
81GF	#2	580.00	239	O
81RF	#2	570.00	239	O
81Z		660.00	239	O
82N	#2	265.00	N	O
82R	#2	275.00	N	O
82Z		365.00	N	O
87G	#2	232.00	237	O
87L	#2	295.00	237	O
87N	#2	205.00	237	O
87NT		405.00	243	O
87R	#2	205.00	237	O
87S	#2	245.00	237	O
87SG	#2	275.00	237	O
87SGT		520.00	243	O
87ST		470.00	243	O
87T	#2	325.00	237	O
87WT		490.00	243	O
87Z		295.00	237	O

117-290

Type No.		Price	Page	F.O.B.
117E	#2	1,090.00	188	O
117ET		1,120.00	186	O
117RT		1,140.00	186	O
117RT-3		1,120.00	186	O
120E	#2	1,040.00	188	O
120R	#2	1,150.00	188	O
120R-3	#2	1,130.00	188	O
128AE	#2	790.00	188	O
134DE	#2	450.00	188	O
134DEP-1		470.00	186	O
134DEP-2		470.00	186	O
134DET		470.00	186	O
137DE	#2	380.00	188	O
137DEP-1		400.00	186	O
137DEP-2		400.00	186	O
137DET		400.00	186	O
144DC	#2	345.00	188	O
144DC-3	#2	345.00	188	O
144DCT		360.00	186	O
144DE	#2	350.00	188	O

Type No.		Price	Page	F.O.B.
144DE-3	#2	350.00	188	⊡
144DEP-1		365.00	186	⊡
144DET		365.00	186	⊡
152DE	#2	340.00	188	⊡
152DEP-1		355.00	186	⊡
152DET		355.00	186	⊡
163DC	#2	215.00	189	⊡
163DCP-1		230.00	187	⊡
163DCP-2		230.00	187	⊡
163DCT		230.00	187	⊡
163DE	#2	225.00	189	⊡
163DEP-1		240.00	N	⊡
163DEP-2		240.00	187	⊡
163DET		240.00	187	⊡
164DC	#2	215.00	189	⊡
164DCP-1		240.00	187	⊡
164DCT		230.00	187	⊡
164DE	#2	225.00	189	⊡
164DEP-1		240.00	187	⊡
164DET		240.00	187	⊡
177DC	#2	230.00	189	⊡
177DCP-1		245.00	187	⊡
177DCP-2		245.00	187	⊡
177DCT		245.00	187	⊡
177DE	#2	240.00	189	⊡
177DEP-1		255.00	187	⊡
177DEP-2		255.00	187	⊡
177DET		255.00	187	⊡
185AC	#2	190.00	189	⊡
190DE	#2	240.00	189	⊡
190DEP-1		255.00	187	⊡
190DEP-2		255.00	187	⊡
190DET		255.00	187	⊡
252DC	#2	330.00	188	⊡
252DCT		345.00	186	⊡
252DE	#2	335.00	188	⊡
252DEP-1		350.00	186	⊡
252DET		350.00	186	⊡
264DE	#2	250.00	189	⊡
264DEP-1		275.00	187	⊡
264DET		275.00	187	⊡
290SC		275.00	187 189	⊡

1060-1934

Type No.		Price	Page	F.O.B.
1127DC	#2	225.00	189	⊡
1127DCP-3		240.00	187	⊡
1127DCT		240.00	187	⊡
1127DE	#2	235.00	189	⊡
1127DEP-3		250.00	187	⊡
1127DET		250.00	187	⊡
1127DK	#2	240.00	189	⊡
1127DKT		265.00	187	⊡
1132DC	#2	260.00	189	⊡
1132DCT		275.00	187	⊡
1132DE	#2	260.00	189	⊡
1132DEP-1		275.00	187	⊡
1132DET		275.00	187	⊡
1180DC	#2	250.00	189	⊡
1180DCP-1		265.00	187	⊡
1180DCT		265.00	187	⊡
1220ASC		215.00	187 189	⊡

2001-2762A

Type No.		Price	Page	F.O.B.
2132DC	#2	300.00	189	⊡
2132DCP-1		315.00	187	⊡
2132DCT		315.00	187	⊡
2132DE	#2	300.00	189	⊡
2132DEP-1		315.00	187	⊡
2132DET		315.00	187	⊡
2132DK	#2	315.00	189	⊡
2132DKT		330.00	187	⊡

10000-19999

Type No.		Price	Page	F.O.B.
10804-9	#1	16.60	251	⊡
10804-11	#1	12.20	251	⊡
10804-17	#1	24.50	251	⊡
10804-66	#1	18.80	251	⊡
10805-4	#1	23.20	251	⊡
10805-5	#1	19.40	251	⊡
10805-6	#1	11.70	251	⊡
10805-11	#1	18.10	251	⊡
10805-12	#1	18.60	251	⊡

20000-29999

Type No.		Price	Page	F.O.B.
25816A-31		13.55/ft.	236 247	⊡
25831-2		7.00/ft.	234 244	⊡
25831-3		6.35/ft.	234 247	⊡
27591-101		12.78/ft.	236	⊡

30000-39999

Type No.		Price	Page	F.O.B.
33682		128.00	243 251	⊡
35422-11		1.30/ft.	222 246	⊡
35422-14		2.22/ft.	226 246	⊡
35422-22		1.70/ft.	224 246	⊡
39816-96		81.00	247	⊡
39816-97		89.00	247	⊡
39816-100		76.00	247	⊡
39816-104		99.00	247	⊡
39816-105		108.00	247	⊡
39816-106		117.00	247	⊡
39816-107		129.00	247	⊡
39818A-208		104.00	247	⊡
39818A-209		121.00	247	⊡
39818A-210		135.00	247	⊡
39818A-211		149.00	247	⊡
39818A-212		163.00	247	⊡
39818A-240		85.00	247	⊡
39818A-241		93.00	247	⊡

40000-42999

Type No.		Price	Page	F.O.B.
40622	#1	8.50	223	⊡
41656B		166.00 +2.22/ft.	248	⊡
41656B-3		130.00	240	⊡
41656B-6		136.00	240	⊡
41690-8		2.30/ft.	226	⊡
41690-9		5.94/ft.	228	⊡
41690-10		7.00/ft.	234	⊡
41690-11		15.10/ft.	236	⊡
41690-17		2.30/ft.	226	⊡
41690-18		1.62/ft.	222	⊡
41690-21		1.62/ft.	222	⊡
41690-22		1.34/ft.	222	⊡
41690-23		13.90/ft.	230	⊡
41690-24		3.37/ft.	224	⊡
41690-43		1.77/ft.	224	⊡
41690-44		3.37/ft.	224	⊡
41690-45		5.94/ft.	228	⊡
41690-46		10.25/ft.	230	⊡
41690-47		7.00/ft.	234	⊡
41690-48		15.10/ft.	236	⊡
41690-49		3.85/ft.	232	⊡
41690-51		3.85/ft.	N	⊡
41690-52		21.00/ft.	N	⊡
42125B		166.00 +2.22/ft.	244 248	⊡
42126B		166.00 +2.22/ft.	244 248	⊡
42128B-3		154.00	240	⊡
42128B-6		160.00	240	⊡
42140		175.00 +14.00/ft.	236 245	⊡
42141		175.00 +25.50/ft.	238 245	⊡
42142		175.00 +39.20/ft.	238 245	⊡
42144		175.00 +27.60/ft.	238 245	⊡
42150B-39		5.75/ft.	228 244	⊡
42150B-48		5.35/ft.	228 247	⊡
42151A-18		12.40/ft.	230 247	⊡
42166B		166.00 +2.22/ft.	248	⊡
42167B		166.00 +2.22/ft.	244 248	⊡
42168B		166.00 +2.22/ft.	244 248	⊡
42169B		166.00 +1.28/ft.	249	⊡
42170B		166.00 +1.28/ft.	249	⊡
42171B		166.00 +1.28/ft.	249	⊡
42172B		166.00 +1.28/ft.	249	⊡
42173B		166.00 +1.28/ft.	249	⊡
42174B		166.00 +1.28/ft.	249	⊡
42178B		166.00 +1.28/ft.	249	⊡
42179B		166.00 +1.28/ft.	249	⊡
42180B		166.00 +1.28/ft.	249	⊡
42182B		166.00 +1.28/ft.	249	⊡
42183B		166.00 +1.28/ft.	249	⊡
42184B		166.00 +1.28/ft.	249	⊡
42188B		166.00 +1.28/ft.	249	⊡
42394-11		50.00 +1.30/ft.	246	⊡
42394-14		50.00 +2.22/ft.	246	⊡
42394-22		50.00 +1.70/ft.	246	⊡
42579A		166.00 +1.28/ft.	249	⊡
42580A		166.00 +1.28/ft.	249	⊡
42826	#2	1,470.00	239	⊡
42896	#2	1,450.00	239	⊡
42962A		166.00 +1.28/ft.	249	⊡
42963A		166.00 +1.28/ft.	249	⊡

43000-49999

Type No.		Price	Page	F.O.B.
43004A		166.00 +2.22/ft.	244 248	⊡
43005A		166.00 +2.22/ft.	244 248	⊡
43552-2		75.00	248	⊡
43554-2		78.00	248	⊡
43557-2		81.00	248	⊡
43660-2		78.00	248	⊡
43716	#1	66.50	227	⊡
43818-5		2.22/ft.	226 244	⊡
43818-6		2.22/ft.	226 244	⊡
43818-41		2/05/ft.	226 247	⊡
43818-42		2.22/ft.	226 244	⊡
44202-3		130.00	240	⊡
44202-6		136.00	240	⊡
47869A-1		3.32/ft.	224 244	⊡
47869A-11		3.32/ft.	224 244	⊡
47869A-12		3.32/ft.	224 244	⊡
48041	#1	200.00	241	⊡
48070	#1	20.00	227	⊡
48100		48.00	248	⊡
48148		305.00	247	⊡
48363A		125.00 +3.32/ft.	244 249	⊡
48364A		125.00 +3.32/ft.	244 249	⊡
48365A		125.00 +3.32/ft.	249	⊡
48366A +3.32/ft.		125.00	249	⊡
48367A +3.32/ft.		125.00 249	244	⊡
48368A +3.32/ft.		125.00 249	244	⊡
48369A +3.32/ft.		125.00 249	244	⊡
48370A +3.32/ft.		125.00 249	244	⊡
48659-7		1.47/ft.	244	⊡
48659-10		1.47/ft.	222 244	⊡
48659-11		1.47/ft.	244	⊡
48695-3		130.00	240	⊡
48695-6		136.00	240	⊡
48822		43.00	248	⊡
49600	#1	60.00	225	⊡
49600-75	#1	66.00	225	⊡
49651	#1	39.00	N	⊡
49768A		100.00	248	⊡
49769A		100.00	248	⊡
49770A		100.00	248	⊡
49774-2		1.70/ft.	224 244	⊡
49774-3		1.70/ft.	224 244	⊡

100000-199999

Type No.		Price	Page	F.O.B.
104300-2		234.00	241 251	⊡
120810-1	#1	55.00	225	⊡
124800-1	#1	168.00	229	⊡
124990-1	#1	155.00	227	⊡

200000-299999

Type No.		Price	Page	F.O.B.
200834-3		168.00	240	⊡
200834-6		174.00	240	⊡
201066		166.00 +1.70/ft.	249	⊡
201067		166.00 +1.70/ft.	249	⊡
201068		166.00 +1.70/ft.	249	⊡
201069		166.00 +1.70/ft.	249	⊡
201070		166.00 +1.70/ft.	249	⊡
201071		166.00 +1.70/ft.	249	⊡
201072		166.00 +1.70/ft.	249	⊡
201073		166.00 +1.70/ft.	249	⊡
201074A		166.00 +1.70/ft.	244 249	⊡
201075A		166.00 +1.70/ft.	244 249	⊡
201076A		166.00 +1.70/ft.	249	⊡
201077A		166.00 +1.70/ft.	249	⊡
201078A		166.00 +1.70/ft.	244 249	⊡
201079A		166.00 +1.70/ft.	244 249	⊡
201080A		166.00 +1.70/ft.	249	⊡
201081A		166.00 +1.70/ft.	249	⊡
201082A		154.00 +1.47/ft.	249	⊡
201083A		154.00 +1.47/ft.	244 249	⊡
201084A		154.00 +1.47/ft.	244 249	⊡
201085		154.00 +1.47/ft.	244 249	⊡
201122		95.00	248	⊡
201123		76.00	248	⊡
201124		87.00	248	⊡
201942		245.00	231	⊡
202376-3		245.00	240	⊡
202376-6		251.00	240	⊡
203361		234.00	241	⊡
205360		9.22/ft.	230 247	⊡
206161	#1	88.00	227	⊡
207032-1		3.70/ft.	244	⊡
207032-2		3.70/ft.	244	⊡
207033-1		1.47/ft.	244	⊡
207033-2		1.47/ft.	244	⊡
207038		154.00 +1.47/ft.	244	⊡
207039		154.00 +1.47/ft.	244	⊡
207040		154.00 +1.47/ft.	244	⊡
207043		170.00 +5.75/ft.	244	⊡
207044		170.00 +5.75/ft.	244	⊡
207045		210.00 +3.70/ft.	244	⊡
207046		210.00 +3.70/ft.	244	⊡
207047		210.00 +3.70/ft.	244	⊡
207048		210.00 +3.70/ft.	244	⊡
207051		210.00 +7.00/ft.	244	⊡
207052		210.00 +7.00/ft.	244	⊡
207053		154.00 +1.47/ft.	244	⊡
207054		154.00 +1.47/ft.	244	⊡
207057		154.00 +1.47/ft.	244	⊡
207058		154.00 +1.47/ft.	244	⊡
207760		18.90/ft.	N	⊡
207761		175.00 19.80/ft.	N	⊡

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment. #2 For cable or waveguide assemblies 50 ft. or less, add $20.00 per connector attachment.

⊡ Orland Park, Illinois

ANDREW

To Order

Duplicate, complete and return this form

- FAX (312) 349-5943
- Write to: Andrew Corporation
  10500 West 153rd Street
  Orland Park, IL 60462
- Or phone toll free: 1-800-255-1479

Sold to:

Name ______

Address ______

City ______ State ______ Zip ______

Ship to:

Name ______

Address ______

City ______ State ______ Zip ______

Ultimate destination

(Other than U.S.) ______

Purchase order no. ______

Bill to:

Name ______

Address ______

City ______ State ______ Zip ______

Andrew Type Number	Description*	Frequency (where applicable)	Quantity	Length	Unit or Per foot Price	Extended Price

*For cables and waveguides, specify whether connectors should be factory attached or shipped loose. When attached connectors on an assembly are different, specify which is first off the reel. For microwave antennas, specify any desired options. See Catalog 33, page 93.

Special marking on packages

______

______

______

Packing requirements ☐ Standard ☐ Export

Special (specify) ______

______

______

Ship by ☐ Surface ☐ Air ☐ Ocean

Requested Carrier ______

(if none specified, we will use the most economical method)

Shipping charges ☐ Collect ☐ Prepay and bill
☐ Quoted fixed freight amount

Requested ship date ______

OK to ship early? ☐ Yes ☐ No Partials OK? ☐ Yes ☐ No

Sales tax ☐ Applicable
☐ Not applicable
Resale no. ______

Specify special inspection requirements, such as customer, government, certificate of compliance

______

______

Request Andrew to acknowledge order by
☐ Phone ☐ FAX ☐ Mail

Buyer's name and phone number

Name ______

Phone ( ) ______ FAX ( ) ______

Signature ______ Date ______

Thank you for your order.

Order Form

Microwave System Planning

The worksheet on page 5 is for use in planning microwave antenna systems using parabolic antennas and HELIAX® coaxial cables. A similar sheet for systems using HELIAX elliptical waveguide is presented on page 7. Andrew Type numbers and prices for typical components are tabulated below.

Further planning information for microwave antenna systems is presented on pages 7-21 of Catalog 33. In addition, several "Microwave System Planner" worksheets are available from Andrew on request. Call 1-800-225-1479 and request the following bulletins:

Antenna Types	Transmission Line Types	Bulletin No.
Parabolic	HELIAX Elliptical Waveguide	8731
Parabolic	HELIAX Coaxial Cable	8732
Horn	HELIAX Elliptical Waveguide	8733
Horn	Circular Waveguide (KS Compatible)	8734
Horn	Circular Waveguide	8739
Parabolic	Circular Waveguide	8740

HELIAX Coaxial Cable Components for Microwave Antenna System – Pressurized

Item No.	Description	7/8" Above 1700 MHz	Price $U.S.	1-1/4" Above 1700 MHz	Price $U.S.	1-5/8" Above 1700 MHz	Price $U.S.	See Catalog 33 Pages
	Antenna Input Impedance	7/8" EIA 50 ohm		7/8" EIA 50 ohm		7/8" EIA 50 ohm		
5	HELIAX Foam-Dielectric Cable	–		LDF6P-50*	9.15/ft	–		230
5	HELIAX Air-Dielectric Cable	HJ5P-50	6.42/ft	–		HJ7P-50A	13.85/ft	240, 242
6	7/8" EIA Flange Connector, Top	75RT	286.00	L46S	166.00	87ST	440.00	241, 243
6	7/8" EIA Flange Connector, Bottom	75GT	325.00	L46S	166.00	87SGT	490.00	243
6	N Jack Alternate Connector, Bottom	75NT	250.00	L46N	98.00	87NT	380.00	241
7	Grounding Kit (3-points)	204989-2	24.00	204989-3	25.00	204989-4	25.00	255
8	Hanger Kit of 10	42396A-5	38.00	42396A-1	38.00	42396A-2	38.00	253
	Threaded Rod Support Kit of 5							
	12 in Rod	31771-4	70.00	31771-4	70.00	31771-4	70.00	253
	24 in Rod	31771-6	100.00	31771-6	100.00	31771-6	100.00	253
9	Waveguide Boot	48939-1	65.00	48939-3	65.00	48939-4	65.00	256
9	Feed-Thru Plate	48940-(**)		48940-(**)		48940-(**)		256
10	Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)							
	1700-2300 MHz	200834-3	157.00	200834-3	157.00	200834-3	157.00	240
	2500-2700 MHz	202638-3	152.00	202638-3	152.00	202638-3	152.00	240
10	Optional Jumper, N Plug/N Plug, 3 ft (1 m)							
	1700-2300 MHz	41656B-3	122.00	41656B-3	122.00	41656B-3	122.00	240
	2300-2700 MHz	48695-3	122.00	48695-3	122.00	48695-3	122.00	240
11	Hoisting Grip	19256B	38.50	24312A	47.50	24312A	47.50	255

*Type LDF6P-50 includes pressure path for use with air-dielectric antennas.

**Number of openings.

HELIAX Coaxial Cable Components for Microwave Antenna System – Unpressurized

Item No.	Description	7/8" Above 1427 MHz	Price $U.S.	1-1/4" Above 1427 MHz	Price $U.S.	1-5/8" Above 1427 MHz	Price $U.S.	See Catalog 33 Pages
	Antenna Input Impedance	"F" Flange 50 ohm		"F" Flange 50 ohm		"F" Flange 50 ohm		
4	Optional Jumper, "F" male/"F" male, 3 ft (1 m)							
	1700-2300 MHz	202376-3	230.00	–		202376-3		240
5	HELIAX Foam-Dielectric Cable	LDF5P-50A	5.48/ft	LDF6P-50	9.15/ft	LDF7P-50A	12.30/ft	240
6	"F" Flange Connector, male, Top	L45F	105.00	L46F	160.00	L47F	225.00	241
6	"F" Flange Connector, female, Top	48041	188.00	–		201942	230.00	241
6	7/8" EIA Flange Connector, Bottom	L45R	88.00	L46R	166.00	–		241
6	N Jack Alternate Connector, Bottom	L45N	58.00	L46N	98.00	L47N	185.00	241
7	Grounding Kit (3-points)	204989-2	24.00	204989-3	25.00	204989-4	25.00	255
8	Hanger Kit of 10	42396A-5	38.00	42396A-1	38.00	42396A-2	38.00	253
	Threaded Rod Support Kit of 5							
	12 in Rod	31771-4	70.00	31771-4	70.00	31771-4	70.00	253
	24 in Rod	31771-6	100.00	31771-6	100.00	31771-6	100.00	253
9	Waveguide Boot	48939-1	65.00	48939-3	65.00	48939-4	65.00	256
9	Feed-Thru Plate	48940-(**)		48940-(**)		48940-(**)		256
10	Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)							
	1700-2300 MHz	200834-3	157.00	200834-3	157.00	–		240
	2500-2700 MHz	202638-3	152.00	202638-3	152.00	–		240
10	Optional Jumper, N Plug/N Plug							
	1427-1535 MHz	44202-3	122.00	44202-3	122.00	44202-3	122.00	240
	1700-2300 MHz	41656B-3	122.00	41656B-3	122.00	41656B-3	122.00	240
	2300-2700	48695-3	122.00	48695-3	122.00	48695-3	122.00	240
11	Hoisting Grip	19256B	38.50	24312A	47.50	24312A	47.50	255

**Number of openings

System Planning Worksheet

Antennas: Shielded, Standard Parabolic, Grid and GRIDPAK™

Transmission Lines: HELIAX® Coaxial Cable

Customer Name ____________________

Contact ____________________

Project ____________________

Quotation No. ____________________

Telephone ____________________

Customer Ref. No. ____________________

Site Name ____________________

Points to Site(s) ____________________

Antenna System Components

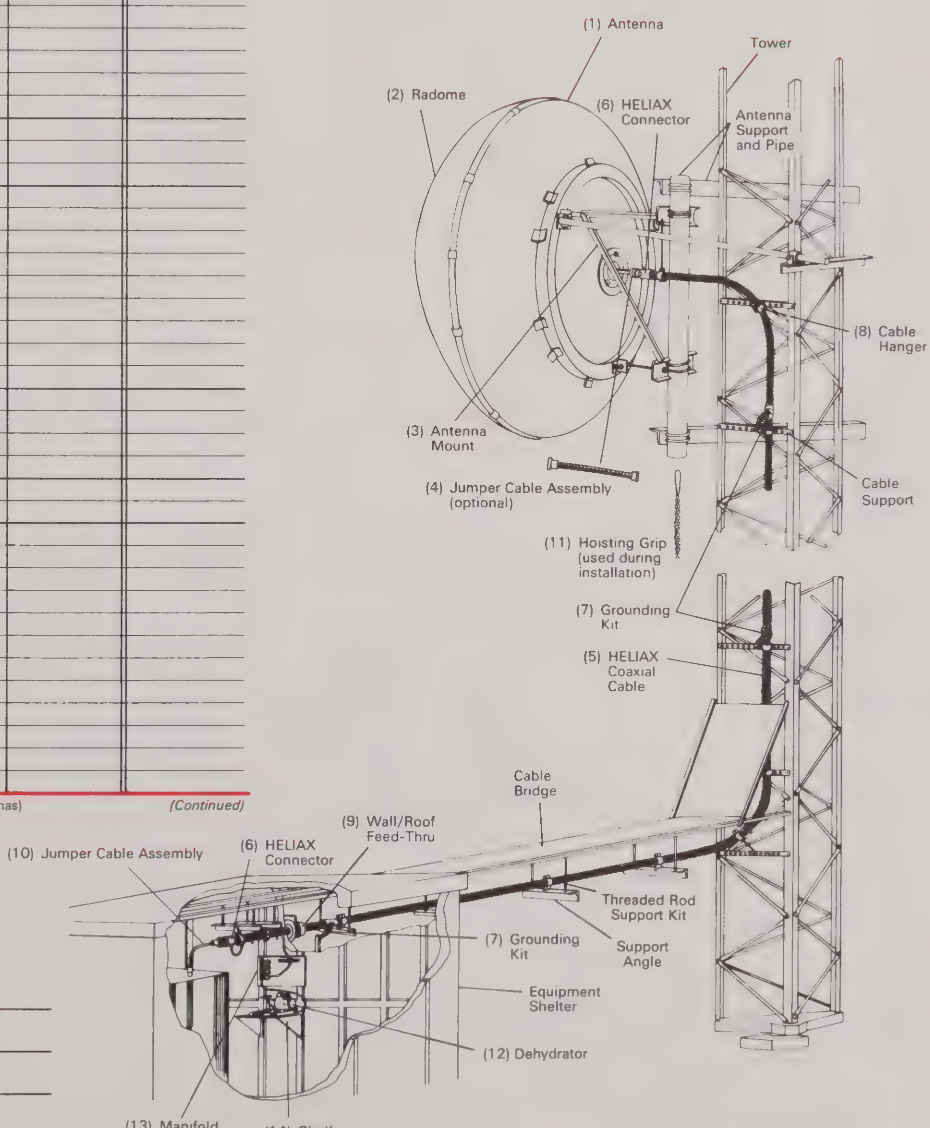
Item No.	Description	Color* (G, O, W)	Type No.	Quantity	Unit Price	Extended Price
	Antenna Equipment					
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
	Transmission Lines and Accessories					
4	Jumper Cable Assembly (optional)					
5	HELIAX Coaxial Cable					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Cable Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Round Member Adaptor Kit					
	Ceiling Adaptor					
	Nylon Cable Tie Kit					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Through or Plate/Boot					
10	Jumper Cable Assembly (optional)					
11	Hoisting Grip					

*G = Gray, O = Orange, W = White (shielded and standard parabolic antennas)

(Continued)

(Continued)

Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
	Pressurization Equipment (for Air-Dielectric Systems)				
12	Dehydrator				
13	Manifold				
	Regulating Tank				
14	Shelf or Floorstand				
	Monitor				
	Total Antenna System Estimate FOB Factory				



Prepared By ____________________

Date ____________________

Telephone ____________________

Microwave System Planning

The worksheet on page 7 is for use in planning microwave antenna systems using parabolic antennas and HELIAX® elliptical waveguide. A similar sheet for systems using HELIAX coaxial cables is presented on page 5. Andrew Type numbers and prices for typical components are tabulated below.

Further planning information for microwave antenna systems is presented on pages 7-21 of Catalog 33. In addition, several "Microwave System Planner" worksheets are available from Andrew on request. Call 1-800-255-1479 and request the following bulletins:

Antenna Types	Transmission Line Types	Bulletin No.
Parabolic	HELIAX Elliptical Waveguide	8731
Parabolic	HELIAX Coaxial Cable	8732
Horn	HELIAX Elliptical Waveguide	8733
Horn	Circular Waveguide (KS Compatible)	8734
Horn	Circular Waveguide	8739
Parabolic	Circular Waveguide	8740

Waveguide Components for Microwave Antenna Systems

Item No.	Description	3.4 to 4.2 GHz	Price $U.S.	5.6 to 6.425 GHz	Price $U.S.	6.425 to 7.125 GHz	Price $U.S.	See Catalog 33 Pages
	Waveguide Flanges	CPR229G		CPR137G		CPR137G		
4	Flex-Twist Section	55421-24	595.00	55415-24	405.00	55415-24	405.00	204,205
5	Elliptical Waveguide	EWP37	18.40/ft	EWP52	15.00/ft	EWP63	13.10/ft	180-194
6	Connectors (Top and Bottom)	137DET	375.00	252DET	330.00	163DET	225.00	186, 187
7	Grounding Kit (3-points)	204989-5	26.00	204989-4	25.00	204989-4	25.00	192
8	Hanger	42396A-4	38.00	42396A-8	38.00	42396A-7	37.00	190
	Threaded Rod Support Kit of 5							
	12 in Rod	31771-4	70.00	31771-4	70.00	31771-4	70.00	191
	24 in Rod	31771-6	100.00	31771-6	100.00	31771-6	100.00	191
9	Waveguide Boot	48939-37	72.00	48939-52	72.00	48939-63	72.00	193
9	Feed-Thru Plate	48940-(*)		48940-(*)		48940-(*)		193
10	90° Elbow, E Plane	55402-229	485.00	55402-137	205.00	55402-137	205.00	204, 205
	H Plane	55403-229	485.00	55403-137	205.00	55403-137	205.00	204, 205
11	Pressure Window	55001-229	47.00	55001-137	47.00	55001-137	47.00	204, 205
	Hoisting Grip	31535	53.00	24312A	47.50	24312A	47.50	192
	Bending Tool Kit	33586-3	280.00	33586-7	240.00	33586-8	230.00	192

*Specify number of openings.

Waveguide Components for Microwave Antenna Systems

Item No.	Description	10.5 to 11.7 GHz	Price $U.S.	12.2 to 13.25 GHz	Price $U.S.	17.7 to 19.7 GHz	Price $U.S.	See Catalog 33 Pages
	Waveguide Flanges	CPR90G		WR75 choke or cover		UG-595/U UG-596A/U		
4	Flex-Twist Section	55411-24	350.00	51747-24	295.00	163619-24	350.00	204, 205
5	Elliptical Waveguide	EWP90	11.80/ft	EWP127A	10.70/ft	EWP180	8.65/ft	180-194
6	Connectors (Top and Bottom)	190DET	240.00	1127DCT	225.00	1180DCT	250.00	186, 187
7	Grounding Kit (3-points)	204989-2	24.00	204989-2	24.00	204989-1	19.00	192
8	Hanger	42396A-5	38.00	42396A-9	38.00	43211	29.00	190
	Threaded Rod Support Kit of 5							
	12 in Rod	31771-4	70.00	31771-4	70.00	31771-4	70.00	191
	24 in Rod	31771-6	100.00	31771-6	100.00	31771-6	100.00	191
9	Waveguide Boot	48939-90	72.00	48939-122	72.00	48939-180	72.00	193
9	Feed-Thru Plate	48940-(*)		48940-(*)		48940-(*)		193
10	90° Elbow, E Plane	55402-90	200.00	55220-75	115.00	55220-42	145.00	204, 205
	H Plane	55403-90	200.00	55221-75	115.00	55221-42	145.00	204, 205
11	Pressure Window	55001-90	47.00	55000-75	36.00	55000-42	36.00	204, 205
	Hoisting Grip	29958	38.50	29958	38.50	43094	27.00	192
	Bending Tool Kit	33586-1	230.0	33586-1	230.00	33586-1	230.00	192

*Specify number of openings

ANDREW

System Planning Worksheet

Antennas: Shielded and Standard Parabolic
Transmission Lines: HELIAX® Elliptical Waveguide

Customer Name ______________________
Contact ______________________
Project ______________________
Quotation No. ______________________
Telephone ______________________
Customer Ref. No. ______________________
Site Name ______________________
Points to Site(s) ______________________

Antenna System Components

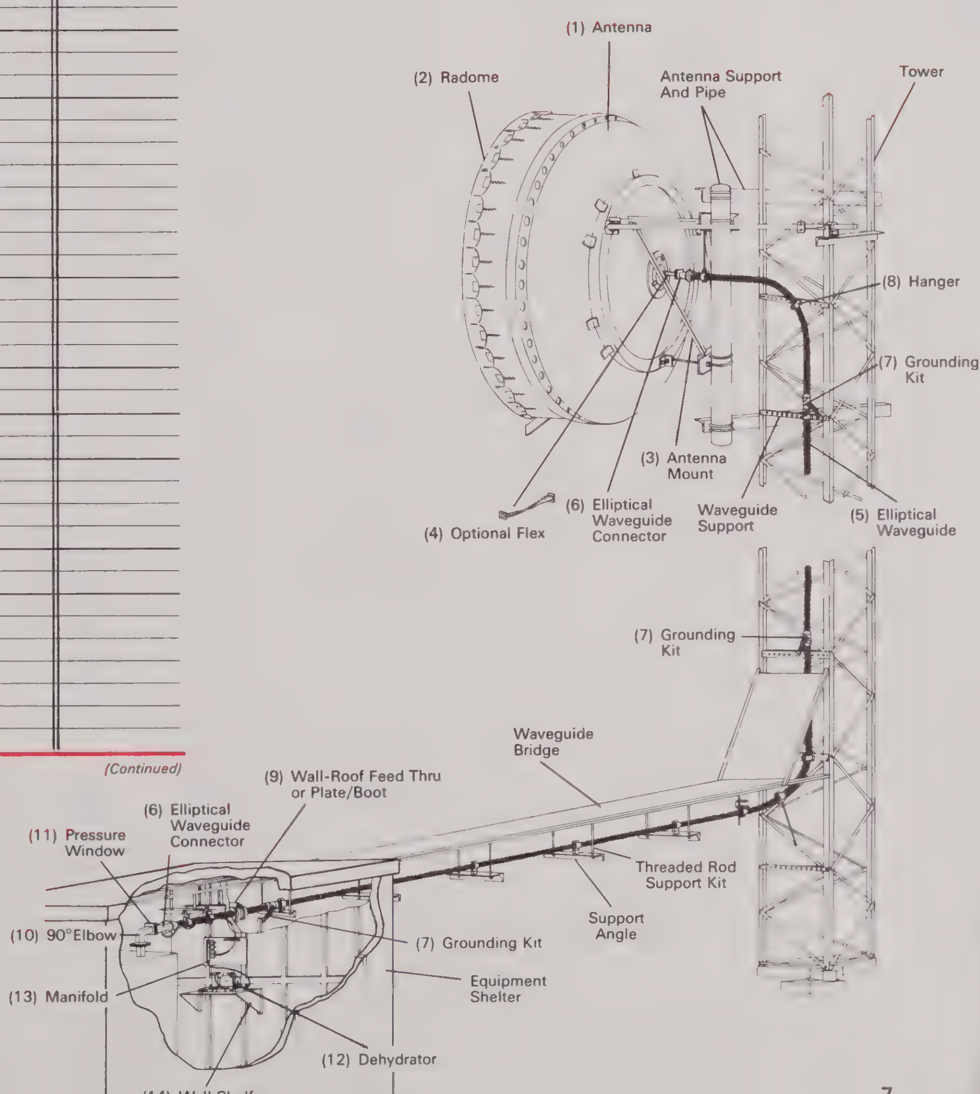
Item No.	Description	Color* (G, O, W)	Type No.	Quantity	Unit Price	Extended Price
	Antenna Equipment					
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
	Transmission Lines and Accessories					
4	Flex Section (optional)					
5	HELIAX Elliptical Waveguide					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Waveguide Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Adaptor					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Through or Plate/Boot					
	Flex Section (optional)					
10	90° Elbow					
	Other					
11	Pressure Window					
	Hoisting Grip					
	Bending Tool Kit					
	Other					

*G = Gray, O = Orange, W = White

(Continued)

(Continued)

Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
	Pressurization Equipment				
12	Dehydrator				
13	Manifold				
	Regulating Tank				
14	Shelf or Floorstand				
	Monitor				
	Other				
	Total Antenna System Estimate FOB Factory				



Prepared By ______________________
Date ______________________
Telephone ______________________

Prices by Product Category in Catalog Sequence

Terms

This price list covers the product line presented in Catalog 33. Prices and specifications are subject to change without notice. Firm quotations are available for specific time periods. Prices as listed are F.O.B. Orland Park, Illinois where noted [O]; Denton, Texas where noted [D]; Richardson, Texas where noted [R]; Campbellfield, Victoria, Australia where noted [A]; Lochgelly, Fife, Great Britain where noted [B]; or Whitby, Ontario, Canada where noted [C]; freight collect, and do not include export packing, insurance, taxes, tariffs, or duties. For international shipments, quotations may be obtained F.O.B. plant, F.A.S. port of departure, or C.I.F. port of entry. Refundable deposits are charged for some skids and large size cable reels in the Shipping Information section. All orders are subject to a minimum charge of $50.00 net. All orders are subject to acceptance by Andrew at corporate headquarters.

Microwave Antennas

Microwave Antennas — Pages 58-93

F.O.B. Denton, Texas, except where otherwise specified.

335-365 MHz — Page 58

Type Number	Diameter ft. (m)	Price $ U.S.	
GRIDPAK™ Antennas, Unpressurized			
KP6-335A	6 (2.0)	1,020.00	O
KP10-335A	10 (3.0)	2,250.00	O
KP13-335B	13 (4.0)	3,880.00	O
Mini GRIDPAK Antennas, Unpressurized			
MKP-335A	6.6x3.3 (2 × 1)	On App.	O

365-403 MHz — Page 58

Type Number	Diameter ft. (m)	Price $ U.S.	
GRIDPAK Antennas, Unpressurized			
KP6-365A	6 (2.0)	1,020.00	O
KP10-365A	10 (3.0)	2,250.00	O
KP13-365B	13 (4.0)	3,880.00	O

403-470 MHz — Page 58

Type Number	Diameter ft. (m)	Price $ U.S.	
GRIDPAK Antennas, Unpressurized			
KP6-403A	6 (2.0)	1,020.00	O
KP10-403A	10 (3.0)	2,250.00	O
KP13-403B	13 (4.0)	3,880.00	O
Mini GRIDPAK Antennas, Unpressurized			
MKP-403A	6.6x3.3 (2 × 1)	On App.	O

820-960 MHz — Page 58

Type Number	Diameter ft. (m)	Price $ U.S.	
GRIDPAK Antennas			
KP6-820A	6 (2.0)	1,020.00	O
KP10-820A	10 (3.0)	2,250.00	O
KP13-820B	13 (4.0)	3,880.00	O
Mini GRIDPAK Antennas			
MKP-820B	6.6x3.3 (2 × 1)	On App.	O

890-960 MHz — Page 59

Type Number	Diameter ft. (m)	Price $ U.S.	
Standard Antennas, Air Dielectric			
P4-9C	4 (1.2)	1,330.00	
P6-9C	6 (1.8)	1,570.00	
P8-9C	8 (2.4)	2,690.00	
P10-9C	10 (3.0)	3,550.00	
P12-9E	12 (3.7)	7,800.00	
P15-9D	15 (4.6)	16,300.00	
Grid Antennas, Unpressurized			
GP4F-890A	4 (1.2)	1,000.00	
GP6F-890A	6 (1.8)	1,400.00	
GP8F-890A	8 (2.4)	2,200.00	
GP10F-890A	10 (3.0)	3,050.00	
GP12F-890	12 (3.7)	5,440.00	

1.427-1.535 GHz — Page 59

Type Number	Diameter ft. (m)	Price $ U.S.	
F-Series Focal Plane Antennas, Unpressurized			
FP4F-15E	4 (1.2)	On App.	B
FP6F-15E	6 (1.8)	On App.	B
FP8F-15E	8 (2.4)	On App.	B
FP10F-15D	10 (3.0)	On App.	B
FP12F-15D	12 (3.7)	On App.	B
Standard Antennas, Air Dielectric			
P4-15C	4 (1.2)	1,650.00	
P6-15C	6 (1.8)	1,990.00	
P8-15C	8 (2.4)	3,070.00	
P10-15C	10 (3.0)	4,020.00	
F-Series Standard Antennas, Unpressurized			
P4F-15D	4 (1.2)	1,340.00	
P6F-15D	6 (1.8)	1,630.00	
P8F-15D	8 (2.4)	2,650.00	
P10F-15D	10 (3.0)	3,440.00	
GRIDPAK Antennas, Air Dielectric			
KP4-15	4 (1.2)	1,120.00	B
KP6-15A	6 (2.0)	1,490.00	B
KP8-15	8 (2.4)	2,260.00	B
KP10-15B	10 (3.0)	3,130.00	B
KP13-15	13 (4.0)	5,330.00	B
F-Series GRIDPAK Antennas, Unpressurized			
KP4F-15	4 (1.2)	1,020.00	B
KP6F-15A	6 (2.0)	1,490.00	B
KP8F-15	8 (2.4)	2,260.00	B
KP10F-15B	10 (3.0)	3,130.00	B
KP13F-15	13 (4.0)	5,330.00	B

1.7-2.11 GHz — Pages 60 and 61

Type Number	Diameter ft. (m)	Price $ U.S.	
High Performance Antennas, Air Dielectric			
HP6-17C	6 (1.8)	6,230.00	
HP8-17D	8 (2.4)	8,260.00	
HP10-17D	10 (3.0)	10,100.00	
HP12-17E	12 (3.7)	14,100.00	
HP15-17D	15 (4.6)	21,200.00	
High Performance Antennas, F-Series, Unpressurized			
HP6F-17C	6 (1.8)	6,230.00	
HP8F-17C	8 (2.4)	8,260.00	
HP10F-17C	10 (3.0)	10,100.00	
HP12F-17C	12 (3.7)	14,100.00	
Focal Plane Antennas, Air Dielectric			
FP8-17D	8 (2.4)	On App.	B
FP10-17D	10 (3.0)	On App.	B
FP12-17D	12 (3.7)	On App.	B
FPX8-17	8 (2.4)	On App.	B
FPX10-17	10 (3.0)	On App.	B
FPX12-17	12 (3.7)	On App.	B
Focal Plane Antennas, F-Series Unpressurized			
FP8F-17D	8 (2.4)	On App.	B
FP10F-17D	10 (3.0)	On App.	B
FP12F-17D	12 (3.7)	On App.	B
Low VSWR Standard Antennas, Air Dielectric			
PL6-17C	6 (1.8)	1,910.00	
PL8-17C	8 (2.4)	3,030.00	
PL10-17C	10 (3.0)	3,930.00	
PL12-17E	12 (3.7)	8,250.00	
PL15-17D	15 (4.6)	16,700.00	
Standard Antennas, F-Series Unpressurized			
P6F-17C	6 (1.8)	1,430.00	
P8F-17C	8 (2.4)	2,460.00	
P10F-17C	10 (3.0)	3,240.00	
P12F-17C	12 (3.7)	7,250.00	

Termination Load — Page 60

Type Number	Flange Mates With	Price $ U.S.	
43734	⅞″ EIA	225.00	O

Prices by Product Category

1.7-2.11 GHz — Pages 60 and 61 *(continued)*

Type Number	Diameter ft. (m)	Price $ U.S.	
Grid Antennas, Air-Dielectric			
GPL6-17A	6 (1.8)	1,820.00	
GPL8-17A	8 (2.4)	2,740.00	
GPL10-17A	10 (3.0)	3,680.00	
GPL12-17A	12 (3.7)	6,150.00	
GPL15-17A	15 (4.6)	13,000.00	
Grid Antennas, F-Series Unpressurized			
GP4F-17	4 (1.2)	1,320.00	
GP6F-17A	6 (1.8)	1,675.00	
GP8F-17A	8 (2.4)	2,610.00	
GP10F-17A	10 (3.0)	3,530.00	
GP12F-17	12 (3.7)	6,100.00	
GP15F-17	15 (4.6)	12,800.00	
GRIDPAK Antennas, Air-Dielectric			
KP4-17	4 (1.2)	1,120.00	B
KP6-17	6 (2.0)	1,490.00	B
KP8-17	8 (2.4)	2,260.00	B
KP10-17	10 (3.0)	3,130.00	B
KP13-17	13 (4.0)	5,330.00	B
GRIDPAK Antennas, F-Series Unpressurized			
KP4F-17	4 (1.2)	1,120.00	B
KP6F-17	6 (2.0)	1,490.00	B
KP8F-17	8 (2.4)	2,260.00	B
KP10F-17	10 (3.0)	3,130.00	B
KP13F-17	13 (4.0)	5,330.00	B

1.85-1.99 GHz — Page 61

Type Number	Diameter ft. (m)	Price $ U.S.
Ultra High Performance Antennas, Air-Dielectric — New Products		
UHP8-18	8 (2.4)	9,370.00
UHP10-18	10 (3.0)	11,400.00
UHP12-18	12 (3.7)	15,800.00
Ultra High Performance Antennas, F-Series Upressurized — New Products		
UHP8F-18	8 (2.4)	9,370.00
UHP10F-18	10 (3.0)	11,400.00
UHP12F-18	12 (3.7)	15,800.00
High Performance Antennas, Air-Dielectric		
HP6-18	6 (1.8)	6,230.00
HP8-18	8 (2.4)	8,260.00
HP10-18	10 (3.0)	10,100.00
HP12-18	12 (3.7)	14,100.00
High Performance Antennas, F-Series Unpressurized		
HP6F-18	6 (1.8)	6,230.00
HP8F-18	8 (2.4)	8,260.00
HP10F-18	10 (3.0)	10,100.00
HP12F-18	12 (3.7)	14,100.00
Low VSWR Standard Antennas, Air-Dielectric		
PL6-18	6 (1.8)	1,910.00
PL8-18	8 (2.4)	3,030.00
PL10-18	10 (3.0)	3,930.00
PL12-18	12 (3.7)	8,250.00
PXL8-18C	8 (2.4)	6,200.00
PXL10-18C	10 (3.0)	6,950.00
PXL12-18C	12 (3.7)	10,900.00
Standard Antennas, F-Series Unpressurized		
P6F-18C	6 (1.8)	1,430.00
P8F-18C	8 (2.4)	2,460.00
P10F-18C	10 (3.0)	3,240.00
Grid Antennas, Air-Dielectric		
GPL6-18	6 (1.8)	1,820.00
GPL8-18	8 (2.4)	2,740.00
GPL10-18	10 (3.0)	3,680.00
GPL12-18	12 (3.7)	6,150.00
GPL15-18	15 (4.6)	13,000.00
Grid Antennas, F-Series Unpressurized		
GP6F-18A	6 (1.8)	1,675.00
GP8F-18A	8 (2.4)	2,610.00
GP10F-18A	10 (3.0)	3,530.00
GP12F-18	12 (3.7)	6,100.00
GP15F-18	15 (4.6)	12,800.00

1.9-2.3 GHz — Pages 62 and 63

Type Number	Diameter ft. (m)	Price $ U.S.	
High Performance Antennas, Air-Dielectric			
HP6-19D	6 (1.8)	6,230.00	
HP8-19D	8 (2.4)	8,260.00	
HP10-19D	10 (3.0)	10,100.00	
HP12-19E	12 (3.7)	14,100.00	
HP15-19D	15 (4.6)	21,200.00	
HPX8-19C	8 (2.4)	9,900.00	
HPX10-19E	10 (3.0)	11,900.00	
HPX12-19D	12 (3.7)	15,800.00	
HPX15-19E	15 (4.6)	22,400.00	
High Performance Antennas, F-Series Unpressurized			
HP6F-19C	6 (1.8)	6,230.00	
HP8F-19C	8 (2.4)	8,260.00	
HP10F-19C	10 (3.0)	10,100.00	
HP12F-19C	12 (3.7)	14,100.00	
HPX8F-19	8 (2.4)	11,800.00	
HPX10F-19	10 (3.0)	13,700.00	
Focal Plane Antennas, Air-Dielectric			
FP8-19D	8 (2.4)	On App.	B
FP10-19D	10 (3.0)	On App.	B
FP12-19D	12 (3.7)	On App.	B
FPX8-19	8 (2.4)	On App.	B
FPX10-19	10 (3.0)	On App.	B
FPX12-19	12 (3.7)	On App.	B
Focal Plane Antennas, F-Series Unpressurized			
FP8F-19D	8 (2.4)	On App.	B
FP10F-19D	10 (3.0)	On App.	B
FP12F-19D	12 (3.7)	On App.	B
Low VSWR Standard Antennas, Air-Dielectric			
PL4-19C	4 (1.2)	1,660.00	
PL6-19C	6 (1.8)	1,910.00	
PL8-19C	8 (2.4)	3,030.00	
PL10-19C	10 (3.0)	3,930.00	
PL12-19E	12 (3.7)	8,250.00	
PL15-19D	15 (4.6)	16,700.00	
PXL8-19C	8 (2.4)	6,200.00	
PXL10-19C	10 (3.0)	6,950.00	
PXL12-19C	12 (3.7)	10,900.00	
PXL15-19C	15 (4.6)	18,600.00	
Standard Antennas, F-Series Unpressurized			
P6F-19C	6 (1.8)	1,430.00	
P8F-19C	8 (2.4)	2,460.00	
P10F-19C	10 (3.0)	3,240.00	
P12F-19C	12 (3.7)	7,250.00	
PXL8F-19	8 (2.4)	7,540.00	
PXL10F-19	10 (3.0)	8,250.00	
Grid Antennas, Air-Dielectric			
GPL6-19A	6 (1.8)	1,820.00	
GPL8-19A	8 (2.4)	2,740.00	
GPL10-19A	10 (3.0)	3,680.00	
GPL12-19A	12 (3.7)	6,150.00	
GPL15-19A	15 (4.6)	13,000.00	
Grid Antennas, F-Series Unpressurized			
GP6F-19A	6 (1.8)	1,675.00	
GP8F-19A	8 (2.4)	2,610.00	
GP10F-19A	10 (3.0)	3,530.00	
GP12F-19	12 (3.7)	6,000.00	
GP15F-19	15 (4.6)	12,800.00	
GRIDPAK Antennas, Air-Dielectric			
KP4-19	4 (1.2)	1,120.00	B
KP6-19	6 (2.0)	1,490.00	B
KP8-19	8 (2.4)	2,260.00	B
KP10-19	10 (3.0)	3,130.00	B
KP13-19	13 (4.0)	5,330.00	B
GRIDPAK Antennas, F-Series Unpressurized			
KP4F-19	4 (1.2)	1,120.00	B
KP6F-19	6 (2.0)	1,490.00	B
KP8F-19	8 (2.4)	2,260.00	B
KP10F-19	10 (3.0)	3,130.00	B
KP13F-19	13 (4.0)	5,330.00	B

Termination Load — Pages 62 and 64

Type Number	Flange Mates With	Price $ U.S.	
43734	⅞″ EIA	225.00	O

B F.O.B. Lochgelly, Fife, Great Britain O Orland Park, Illinois

Prices by Product Category

Prices by Product Category

2.1-2.2 GHz — Page 64

Ultra High Performance Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
UHP8-21	8 (2.4)	9,370.00	
UHP10-21	10 (3.0)	11,400.00	
UHP12-21	12 (3.7)	15,800.00	
UHX8-21*	8 (2.4)	10,800.00	
UHX10-21*	10 (3.0)	12,950.00	
UHX12-21*	12 (3.7)	17,700.00	

Ultra High Performance Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
UHP8F-21	8 (2.4)	9,370.00	
UHP10F-21	10 (3.0)	11,400.00	
UHP12F-21	12 (3.7)	15,800.00	

High Performance Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
HP8-21	8 (2.4)	8,260.00	
HP10-21	10 (3.0)	10,100.00	
HP12-21	12 (3.7)	14,100.00	

High Performance Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
HP8F-21	8 (2.4)	8,260.00	
HP10F-21	10 (3.0)	10,100.00	
HP12F-21	12 (3.7)	14,100.00	

Low VSWR Standard Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
PL6-21C	6 (1.8)	2,130.00	
PL8-21	8 (2.4)	3,030.00	
PL10-21	10 (3.0)	3,930.00	
PL12-21	12 (3.7)	8,250.00	

Standard Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
P4F-21C	4 (1.2)	1,220.00	
P6F-21C	6 (1.8)	1,670.00	
P8F-21C	8 (2.4)	2,460.00	
P10F-21C	10 (3.0)	3,240.00	

Grid Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
GPL6-21	6 (1.8)	1,820.00	
GPL8-21	8 (2.4)	2,740.00	
GPL10-21	10 (3.0)	3,680.00	
GPL12-21	12 (3.7)	6,150.00	
GPL15-21	15 (4.6)	13,000.00	

Grid Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
GP6F-21A	6 (1.8)	1,675.00	
GP8F-21A	8 (2.4)	2,610.00	
GP10F-21A	10 (3.0)	3,530.00	
GP12F-21	12 (3.7)	6,000.00	
GP15F-21	15 (4.6)	12,800.00	

2.3-2.5 GHz — Page 65

Focal Plane Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
FP4-23D	4 (1.2)	On App.	B
FP6-23D	6 (1.8)	On App.	B
FP8-23D	8 (2.4)	On App.	B
FP10-23D	10 (3.0)	On App.	B
FP12-23D	12 (3.7)	On App.	B
FPX6-23C	6 (1.8)	On App.	B
FPX8-23C	8 (2.4)	On App.	B
FPX10-23C	10 (3.0)	On App.	B
FPX12-23C	12 (3.7)	On App.	B

Focal Plane Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
FP4F-23D	4 (1.2)	On App.	B
FP6F-23D	6 (1.8)	On App.	B
FP8F-23D	8 (2.4)	On App.	B
FP10F-23D	10 (3.0)	On App.	B
FP12F-23D	12 (3.7)	On App.	B

Low VSWR Standard Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
PL6-23D	6 (1.8)	1,910.00	
PL8-23D	8 (2.4)	3,030.00	
PL10-23D	10 (3.0)	3,930.00	
PL12-23D	12 (3.7)	8,250.00	

Standard Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
P4F-23E	4 (1.2)	1,160.00	
P6F-23E	6 (1.8)	1,430.00	
P8F-23E	8 (2.4)	2,460.00	
P10F-23E	10 (3.0)	3,240.00	
P12F-23E	12 (3.7)	7,250.00	

GRIDPAK Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
KP4-23	4 (1.2)	1,120.00	B
KP6-23	6 (1.8)	1,490.00	B
KP8-23	8 (2.4)	2,260.00	B
KP10-23	10 (3.0)	3,130.00	B
KP13-23	13 (4.0)	5,330.00	B

GRIDPAK Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
KP4F-23	4 (1.2)	1,120.00	B
KP6F-23	6 (1.8)	1,490.00	B
KP8F-23	8 (2.4)	2,260.00	B
KP10F-23	10 (3.0)	3,130.00	B
KP13F-23	13 (4.0)	5,330.00	B

2.45-2.5 GHz — Page 65

Standard Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
P6F-24C	6 (1.8)	1,430.00	
P8F-24C	8 (2.4)	2,460.00	

2.48-2.7 GHz — Pages 66 and 67

High Performance Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
HP6-25D	6 (1.8)	6,230.00	
HP8-25D	8 (2.4)	8,260.00	
HP10-25D	10 (3.0)	10,100.00	
HP12-25D	12 (3.7)	14,100.00	

Focal Plane Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
FP4-25D	4 (1.2)	On App.	B
FP6-25D	6 (1.8)	On App.	B
FP8-25D	8 (2.4)	On App.	B
FP10-25D	10 (3.0)	On App.	B
FP12-25D	12 (3.7)	On App.	B
FPX6-25C	6 (1.8)	On App.	B
FPX8-25C	8 (2.4)	On App.	B
FPX10-25C	10 (3.0)	On App.	B
FPX12-25C	12 (3.7)	On App.	B

Focal Plane Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
FP4F-25D	4 (1.2)	On App.	B
FP6F-25D	6 (1.8)	On App.	B
FP8F-25D	8 (2.4)	On App.	B
FP10F-25D	10 (3.0)	On App.	B
FP12F-25D	12 (3.7)	On App.	B

Standard Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
PL6-25D	6 (1.8)	1,910.00	
PL8-25D	8 (2.4)	3,030.00	
PL10-25D	10 (3.0)	3,930.00	
PL12-25D	12 (3.7)	8,250.00	

Standard Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
P4F-25D	4 (1.2)	1,160.00	
P6F-25D	6 (1.8)	1,430.00	
P8F-25D	8 (2.4)	2,460.00	
P10F-25D	10 (3.0)	3,240.00	
P12F-25D	12 (3.7)	7,250.00	

Grid Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
GPL6-25A	6 (1.8)	1,820.00	
GPL8-25A	8 (2.4)	2,740.00	
GPL10-25A	10 (3.0)	3,680.00	

Grid Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
GP6F-25A	6 (1.8)	1,675.00	
GP8F-25A	8 (2.4)	2,610.00	
GP10F-25A	10 (3.0)	3,530.00	

GRIDPAK Antennas, Air-Dielectric

Type Number	Diameter ft. (m)	Price $ U.S.	
KP4-25	4 (1.2)	1,120.00	B
KP6-25	6 (2.0)	1,490.00	B
KP8-25	8 (2.4)	2,260.00	B
KP10-25	10 (3.0)	3,130.00	B
KP13-25	13 (4.0)	5,330.00	B

GRIDPAK Antennas, F-Series Unpressurized

Type Number	Diameter ft. (m)	Price $ U.S.	
KP4F-25	4 (1.2)	1,120.00	B
KP6F-25	6 (2.0)	1,490.00	B
KP8F-25	8 (2.4)	2,260.00	B
KP10F-25	10 (3.0)	3,130.00	B
KP13F-25	13 (4.0)	5,330.00	B

3.4-3.9 GHz — Page 67

UHX® Ultra High Performance Antennas

Type Number	Diameter ft. (m)	Price $ U.S.	
UHX8-34C	8 (2.4)	On App.	
UHX10-34C	10 (3.0)	On App.	
UHX12-34C	12 (3.7)	On App.	
UHX15-34C	15 (4.6)	On App.	

Focal Plane Antennas

Type Number	Diameter ft. (m)	Price $ U.S.	
FP10-34	10 (3.0)	On App.	B
FP12-34	12 (3.7)	On App.	B

Termination Load — Page 67

Type Number	Flange Mates With	Price $ U.S.	
39099-229	CPR229G, PDR40	105.00	O

B F.O.B. Lochgelly, Fife, Great Britain   O F.O.B. Orland Park, Illinois   *New Product

Type Number	Diameter ft. (m)	Price $ U.S.	
3.54-4.18 GHz — Page 67			
UHX® Ultra High Performance Antennas			
UHX8-35D	8 (2.4)	On App.	
UHX10-35C	10 (3.0)	On App.	
UHX12-35D	12 (3.7)	On App.	
UHX15-35C	15 (4.6)	On App.	
3.6-4.2 GHz — Page 67			
Focal Plane Antennas			
FP10-36	10 (3.0)	On App.	B
FP12-36	12 (3.7)	On App.	B
FPX10-36	10 (3.0)	On App.	B
FPX12-36	12 (3.7)	On App.	B
3.7-4.2 GHz — Page 67			
UHXII® Ultra High Performance Antennas			
UHX8-37H	8 (2.4)	11,740.00	
UHX10-37H	10 (3.0)	14,300.00	
UHX12-37H	12 (3.7)	18,850.00	
UHX15-37H	15 (4.6)	23,900.00	
Low VSWR Standard Antennas			
PL6-37E	6 (1.8)	2,520.00	
PL8-37D	8 (2.4)	3,700.00	
PL10-37D	10 (3.0)	4,580.00	
PL12-37F	12 (3.7)	8,900.00	
PL15-37D	15 (4.6)	17,200.00	
PXL10-37D	10 (3.0)	5,380.00	
PXL12-37E	12 (3.7)	9,700.00	
PXL15-37D	15 (4.6)	18,000.00	
4.4-5.0 GHz — Page 68			
High Performance Antennas			
HP6-44E	6 (1.8)	6,230.00	
HP8-44E	8 (2.4)	8,260.00	
HP10-44E	10 (3.0)	10,100.00	
HP12-44F	12 (3.7)	14,100.00	
HP15-44E	15 (4.6)	21,200.00	
HPX6-44D	6 (1.8)	7,150.00	
HPX8-44D	8 (2.4)	9,200.00	
HPX10-44D	10 (3.0)	11,200.00	
HPX12-44D	12 (3.7)	15,300.00	
Low VSWR Standard Antennas			
PL4-44E	4 (1.2)	1,700.00	
PL6-44E	6 (1.8)	1,940.00	
PL8-44E	8 (2.4)	3,100.00	
PL10-44E	10 (3.0)	4,090.00	
PL12-44G	12 (3.7)	8,400.00	
PL15-44F	15 (4.6)	16,800.00	
PXL4-44	4 (1.2)	2,810.00	
PXL6-44	6 (1.8)	3,110.00	
PXL8-44	8 (2.4)	4,070.00	
PXL10-44	10 (3.0)	4,970.00	
PXL12-44	12 (3.7)	9,300.00	

Type Number	Diameter ft. (m)	Price $ U.S.	
5.6-6.2 GHz — Page 69			
UHX Ultra High Performance Antennas			
UHX10-56C	10 (3.0)	On App.	
UHX12-56C	12 (3.7)	On App.	
5.8-6.425 GHz — Page 69			
High XPD Antennas			
HXPD12-58	12 (3.7)	On App.	B
5.925-6.425 GHz — Page 69			
UHXII Ultra High Performance Antennas			
UHX6-59H	6 (1.8)	8,840.00	
UHX8-59H	8 (2.4)	11,120.00	
UHX10-59H	10 (3.0)	13,550.00	
UHX12-59H	12 (3.7)	18,100.00	
UHX15-59H	15 (4.6)	23,600.00	
UHX10-59J	10 (3.0)	13,550.00	
UHX12-59J	12 (3.7)	18,800.00	
UHX Ultra High Performance/ High XPD Antennas			
UHX10X-59C	10 (3.0)	14,100.00	
UHX12X-59C	12 (3.7)	18,700.00	
UHX Ultra Gain Antennas			
UGX10R-59C	10 (3.0)	13,000.00	
UGX12R-59D	12 (3.7)	17,200.00	
Focal Plane Antennas			
FP8-59	8 (2.4)	On App.	B
FP10-59	10 (3.0)	On App.	B
FP12-59	12 (3.7)	On App.	B
FPX8-59	8 (2.4)	On App.	B
FPX10-59	10 (3.0)	On App.	B
FPX12-59	12 (3.7)	On App.	B
Low VSWR Standard Antennas			
PL6-59D	6 (1.8)	1,700.00	
PL8-59D	8 (2.4)	2,880.00	
PL10-59D	10 (3.0)	3,810.00	
PL12-59E	12 (3.7)	8,120.00	
PL15-59D	15 (4.6)	16,500.00	
PXL6-59E	6 (1.8)	2,430.00	
PXL8-59D	8 (2.4)	3,620.00	
PXL10-59D	10 (3.0)	4,570.00	
PXL12-59F	12 (3.7)	8,940.00	
PXL15-59E	15 (4.6)	17,300.00	

Type Number	Diameter ft. (m)	Price $ U.S.	
6.425-7.125 GHz — Page 70			
UHX Ultra High Performance Antennas			
UHX6-65D	6 (1.8)	8,340.00	
UHX8-65D	8 (2.4)	10,300.00	
UHX10-65D	10 (3.0)	12,850.00	
UHX12-65J	12 (3.7)	18,000.00	
UHX15-65E	15 (4.6)	22,400.00	
UHX Ultra High Performance/ High XPD Antennas — New Product			
UHX10X-65	10 (3.0)	14,150.00	
High Performance Antennas			
HP6-65E	6 (1.8)	5,720.00	
HP8-65E	8 (2.4)	7,490.00	
HP10-65E	10 (3.0)	9,480.00	
HP12-65E	12 (3.7)	12,800.00	
HP15-65D	15 (4.6)	20,200.00	
Focal Plane Antennas			
FP6-64	6 (1.8)	On App.	B
FP8-64	8 (2.4)	On App.	B
FP10-64	10 (3.0)	On App.	B
FP12-64	12 (3.7)	On App.	B
FPX6-64	6 (1.8)	On App.	B
FPX8-64	8 (2.4)	On App.	B
FPX10-64	10 (3.0)	On App.	B
FPX12-64	12 (3.7)	On App.	B
Low VSWR Standard Antennas			
PL6-65D	6 (1.8)	1,540.00	
PL8-65D	8 (2.4)	2,600.00	
PL10-65D	10 (3.0)	3,470.00	
PL12-65E	12 (3.7)	7,320.00	
PL15-65D	15 (4.6)	15,100.00	
PXL6-65D	6 (1.8)	2,250.00	
PXL8-65D	8 (2.4)	3,300.00	
PXL10-65D	10 (3.0)	4,170.00	
PXL12-65E	12 (3.7)	8,120.00	
PXL15-65E	15 (4.6)	15,900.00	

Termination Load — Pages 68 and 70

Type Number	Flange Mates With	Price $ U.S.	
39098-187	UG-148C/U, CAR48, PAR48	On App.	O
39099-137	CPR137G, PDR70	50.00	O
39099-112	CPR112G, PDR84	50.00	O

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6.425-7.125 GHz — Page 70

Type Number	Diameter ft. (m)	Price $ U.S.
Standard Antennas		
P4-65D	4 (1.2)	1,180.00
P6-65D	6 (1.8)	1,420.00
P8-65D	8 (2.4)	2,460.00
P10-65D	10 (3.0)	3,330.00
P12-65E	12 (3.7)	6,950.00
P15-65D	15 (4.6)	14,800.00

7.125-7.750 GHz — Page 71

Type Number	Diameter ft. (m)	Price $ U.S.
High Performance Antennas		
HP6-71D	6 (1.8)	6,230.00
HP8-71D	8 (2.4)	8,260.00
HP10-71D	10 (3.0)	10,100.00
HP12-71E	12 (3.7)	14,100.00
HP15-71D	15 (4.6)	21,200.00
HP6-71GE	6 (1.8)	6,230.00
HP8-71GE	8 (2.4)	8,260.00
HP10-71GE	10 (3.0)	10,100.00
HP12-71GF	12 (3.7)	14,100.00
HP15-71GE	15 (4.6)	21,200.00
HPX6-71E	6 (1.8)	7,150.00
HPX8-71E	8 (2.4)	9,200.00
HPX10-71E	10 (3.0)	11,200.00
HPX12-71E	12 (3.7)	15,000.00
HPX15-71D	15 (4.6)	22,400.00
Focal Plane Antennas		
FP4-71	4 (1.2)	On App. B
FP6-71	6 (1.8)	On App. B
FP8-71	8 (2.4)	On App. B
FP10-71	10 (3.0)	On App. B
FP12-71	12 (3.7)	On App. B
FPX6-71	6 (1.8)	On App. B
FPX8-71	8 (2.4)	On App. B
FPX10-71	10 (3.0)	On App. B
FPX12-71	12 (3.7)	On App. B
Low VSWR Standard Antennas		
PL4-71D	4 (1.2)	1,450.00
PL6-71D	6 (1.8)	1,700.00
PL8-71D	8 (2.4)	2,880.00
PL10-71E	10 (3.0)	3,810.00
PL12-71F	12 (3.7)	8,100.00
PL15-71E	15 (4.6)	16,400.00
PL4-71GD	4 (1.2)	1,500.00
PL6-71GD	6 (1.8)	1,770.00
PL8-71GE	8 (2.4)	2,940.00
PL10-71GE	10 (3.0)	3,900.00
PL12-71GF	12 (3.7)	8,120.00
PL15-71GD	15 (4.6)	16,400.00
PXL6-71E	6 (1.8)	2,430.00
PXL8-71E	8 (2.4)	3,630.00
PXL10-71E	10 (3.0)	4,570.00
PXL12-71E	12 (3.7)	8,900.00
Standard Antennas		
P4-71D	4 (1.2)	1,320.00
P6-71D	6 (1.8)	1,550.00
P8-71D	8 (2.4)	2,700.00
P10-71E	10 (3.0)	3,660.00
P12-71F	12 (3.7)	7,800.00
P15-71E	15 (4.6)	16,100.00

7.125-8.4 GHz — Page 71

Type Number	Diameter ft. (m)	Price $ U.S.
High Performance Antennas — New Products		
HP6-71W	6 (1.8)	6,230.00
HP8-71W	8 (2.4)	8,260.00
HP10-71W	10 (3.0)	10,100.00
Standard Antennas		
P4-71GD	4 (1.2)	1,350.00
P6-71GD	6 (1.8)	1,595.00
P8-71GE	8 (2.4)	2,760.00
P10-71GE	10 (3.0)	3,720.00
P12-71GF	12 (3.7)	7,900.00
P15-71GD	15 (4.6)	16,200.00

7.725-8.275 GHz — Page 72

Type Number	Diameter ft. (m)	Price $ U.S.
UHX® Ultra High Performance Antennas		
UHX6-77GD	6 (1.8)	8,540.00
UHX8-77GD	8 (2.4)	10,600.00
UHX15-77GD	15 (4.6)	22,800.00
High XPD Antennas		
HXPD6-77GC	6 (1.8)	9,080.00
HXPD8-77GC	8 (2.4)	11,400.00
HXPD10-77GC	10 (3.0)	13,750.00
HXPD12-77GC	12 (3.7)	18,400.00

7.725-8.5 GHz — Page 73

Type Number	Diameter ft. (m)	Price $ U.S.
Focal Plane Antennas		
FP6-77G	6 (1.8)	On App. B
FP8-77G	8 (2.4)	On App. B
FP10-77G	10 (3.0)	On App. B
FP12-77G	12 (3.7)	On App. B
FPX6-77G	6 (1.8)	On App. B

7.750-8.4 GHz — Page 73

Type Number	Diameter ft. (m)	Price $ U.S.
High Performance Antennas		
HP6-77GE	6 (1.8)	6,230.00
HP8-77GE	8 (2.4)	8,260.00
HP10-77GE	10 (3.0)	10,100.00
HP12-77GF	12 (3.7)	14,100.00
HP15-77GE	15 (4.6)	21,200.00
Low VSWR Standard Antennas		
PL4-77GD	4 (1.2)	1,500.00
PL6-77GE	6 (1.8)	1,770.00
PL8-77GE	8 (2.4)	2,940.00
PL10-77GD	10 (3.0)	3,900.00
PL12-77GF	12 (3.7)	8,120.00
PL15-77GD	15 (4.6)	16,400.00

8.2-8.5 GHz — Page 73

Type Number	Diameter ft. (m)	Price $ U.S.
High Performance Antennas		
HP6-82C	6 (1.8)	6,430.00
HP8-82C	8 (2.4)	8,460.00
HP10-82C	10 (3.0)	10,300.00
HP12-82C	12 (3.7)	14,300.00
HP15-82C	15 (4.6)	21,400.00
HPX6-82C	6 (1.8)	7,350.00
HPX8-82C	8 (2.4)	9,400.00
HPX10-82C	10 (3.0)	11,400.00
HPX12-82C	12 (3.7)	15,200.00
HPX15-82C	15 (4.6)	22,600.00
Low VSWR Standard Antennas		
PL6-82C	6 (1.8)	1,970.00
PL8-82C	8 (2.4)	3,140.00
PL10-82C	10 (3.0)	4,100.00
PL12-82C	12 (3.7)	8,320.00
PL15-82C	15 (4.6)	16,600.00
PXL6-82C	6 (1.8)	2,750.00
PXL8-82C	8 (2.4)	3,830.00
PXL10-82C	10 (3.0)	4,920.00
PXL12-82C	12 (3.7)	9,100.00
PXL15-82C	15 (4.6)	17,400.00

10.5-10.7 GHz — Page 74

Type Number	Diameter ft. (m)	Price $ U.S.
UHX Ultra High Performance Antennas		
UHX4-105	4 (1.2)	5,600.00
LD Series Antennas		
LD2-105C	2 (0.6)	620.00
LD4-105C	4 (1.2)	925.00
LD6-105C	6 (1.8)	1,200.00

10.7-11.7 GHz — Pages 74 and 75

Type Number	Diameter ft. (m)	Price $ U.S.
UHXII Ultra High Performance Antennas		
UHX4-107	4 (1.2)	5,600.00
UHX6-107H	6 (1.8)	8,840.00
UHX8-107H	8 (2.4)	11,120.00
UHX10-107H	10 (3.0)	13,550.00
UHX12-107H	12 (3.7)	18,100.00
High XPD Antennas		
HXPD8-107C	8 (2.4)	11,400.00
HXPD10-107C	10 (3.0)	13,750.00
UHX Ultra Gain Antennas		
UGX10R-107E	10 (3.0)	13,000.00

Termination Loads — Pages 72 and 74

Type Number	Flange Mates With	Price $ U.S.
39099-112	CPR112G, PDR84	50.00 O
39099-90	CPR90G, PDR100	50.00 O

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Type Number	Diameter ft. (m)	Price $ U.S.
10.7-11.7 GHz — Pages 74 and 75		
Low VSWR Standard Antennas		
PL4-107D	4 (1.2)	1,580.00
PL6-107D	6 (1.8)	1,820.00
PL8-107E	8 (2.4)	2,980.00
PL10-107E	10 (3.0)	3,910.00
PL12-107F	12 (3.7)	8,220.00
PXL6-107C	6 (1.8)	2,600.00
PXL8-107C	8 (2.4)	3,680.00
PXL10-107C	10 (3.0)	4,920.00
PXL12-107D	12 (3.7)	9,020.00
12.2-12.7 GHz — Page 75		
High Performance Antennas		
HPX6-122D	6 (1.8)	6,950.00
HPX8-122D	8 (2.4)	8,750.00
HPX10-122C	10 (3.0)	10,900.00
HPX12-122C	12 (3.7)	14,500.00
Standard Antennas		
PX4-122C	4 (1.2)	2,050.00
PX6-122C	6 (1.8)	2,350.00
PX8-122C	8 (2.4)	3,450.00
PX10-122C	10 (3.0)	4,350.00
PX12-122C	12 (3.7)	8,430.00
12.2-13.25 GHz — Pages 75 and 76		
High Performance Antennas		
HP6-122D	6 (1.8)	6,130.00
HP8-122D	8 (2.4)	7,930.00
HP10-122D	10 (3.0)	9,990.00
HP12-122E	12 (3.7)	13,600.00
Standard Antennas		
P4-122D	4 (1.2)	1,340.00
P6-122D	6 (1.8)	1,570.00
P8-122D	8 (2.4)	2,690.00
P10-122E	10 (3.0)	3,550.00
P12-122E	12 (3.7)	7,630.00
LD Antennas		
LD2-122C	2 (0.6)	620.00
LD4-122B	4 (1.2)	925.00
LD6-122B	6 (1.8)	1,200.00
LDX4-122B	4 (1.2)	1,600.00
12.7-13.25 GHz — Page 75		
UHXII® Ultra High Performance Antennas		
UHX8-127H	8 (2.4)	10,600.00
UHX10-127H	10 (3.0)	13,050.00
High Performance Antennas		
HPX6-127D	6 (1.8)	6,950.00
HPX8-127D	8 (2.4)	8,750.00
HPX10-127C	10 (3.0)	10,900.00
HPX12-127C	12 (3.7)	14,500.00
Standard Antennas		
PX4-127C	4 (1.2)	2,050.00
PX6-127C	6 (1.8)	3,250.00
PX8-127C	8 (2.4)	3,450.00
PX10-127C	10 (3.0)	4,350.00
PX12-127C	12 (3.7)	8,430.00

Type Number	Diameter ft. (m)	Price $ U.S.
14.4-15.35 GHz — Page 77		
High XPD Antennas — New Products		
HXPD6-144	6 (1.8)	On App.
HXPD8-144	8 (2.4)	On App.
Standard Antennas		
P2-144D	2 (0.6)	1,350.00
P4-144D	4 (1.2)	2,170.00
P6-144D	6 (1.8)	2,400.00
P8-144E	8 (2.4)	3,450.00
P10-144E	10 (3.0)	4,370.00
PX4-144C	4 (1.2)	2,850.00
PX6-144C	6 (1.8)	3,410.00
PX8-144D	8 (2.4)	4,250.00
PX10-144D	10 (3.0)	5,150.00
17.7-19.7 GHz — Page 77		
High Performance Antennas		
HP2-180E	2 (0.6)	1,440.00
HP4-180E	4 (1.2)	2,160.00
HP6-180E	6 (1.8)	3,860.00
HPX2-180	2 (0.6)	1,790.00
HPX4-180	4 (1.2)	2,620.00
HPX6-180	6 (1.8)	4,260.00
21.2-23.6 GHz — Page 77		
High Performance Antennas		
HP2-220	2 (0.6)	1,440.00
HP4-220A	4 (1.2)	2,160.00
HP6-220	6 (1.8)	3,860.00
Dual Band — Page 80		
UMX® Multiband Antennas, Four Port		
UMX10-459B	10 (3.0)	17,700.00
UMX12-459A	12 (3.7)	22,200.00
UMX12-A465	12 (3.7)	On App.
UMX12-B465	12 (3.7)	On App.
UMX10-611A	10 (3.0)	22,900.00
High Performance Antenna, Four Port		
HPX12-6511C	12 (3.7)	On App.
High Performance Antennas, Two Port		
HP8-611D	8 (2.4)	9,400.00
HP10-611E	10 (3.0)	11,500.00
HP12-611F	12 (3.7)	15,100.00
HP10-782C	10 (3.0)	On App.
HP12-782C	12 (3.7)	On App.
HP15-782C	15 (4.6)	On App.
Standard Antennas, Three Port		
P8-186	8 (2.4)	5,620.00
P10-186	10 (3.0)	6,540.00

Description	Type Number	Price $ U.S.
Multiband Antenna Accessories — Page 80		
For UMX10-459B		
4 Port Combining Network	200816	11,200.00
Standard Tower Mount	203978	3,500.00
Extended Pipe Tower Mount	203978-2	3,600.00
Combiner Ice Shield	200480	240.00
For UMX12-459A		
4 Port Combining Network	200816	11,200.00
Standard Tower Mount	203979	3,950.00
Extended Pipe Tower Mount	203979-2	4,050.00
Combiner Ice Shield	200481	240.00
For UMX10-611A		
Circulators, 6 GHz	206267	1,650.00
Circulators, 11 GHz	206269	1,650.00

Termination Loads — Pages 74, 78 and 80

Type Number	Flange Mates With	Price $ U.S.
39098-75	WR75 choke and cover	50.00 ☐
43734	⅞" EIA, 50 ohm	225.00 ☐
62901-229	CPR229G, PDR40	250.00 ☐
62901-137	CPR137G, PDR70	165.00 ☐
62900-137	PAR70, CAR70, UAR70	150.00 ☐
62901-112	CPR112G, PDR84	160.00 ☐
62901-90	CPR90G, PDR100	150.00 ☐

Microwave Antenna Radomes — Pages 81-83

TEGLAR Radome Replacement Kit — Page 81

Antenna Dia. ft. (m)	Type Number	Price $ U.S.
2 (0.6)	207105	205.00
4 (1.2)	207106	620.00
6 (1.8)	45665-1	970.00
8 (2.4)	45665-2	1,290.00
10 (3.0)	45665-3	1,690.00
12 (3.7)	45665-4	2,000.00
15 (4.6)	45665-5	2,530.00

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Molded Radomes for Standard Antennas — Page 83

Diameter ft. (m)	Unheated Type Number	Unheated Price $ U.S.	Heated, 3.56 GHz and Up Type Number	Heated, 3.56 GHz and Up Price $U.S.	Heated, 890-2700 MHz Type Number	Heated, 890-2700 MHz Price $ U.S.
Standard						
2 (0.6)	R2D	250.00	HR2E	535.00	—	—
4 (1.2)	R4D	440.00	HR4D	940.00	39180	1,240.00
6 (1.8)	R6D	635.00	HR6D	1,200.00	39181	1,600.00
8 (2.4)	R8E	1,150.00	HR8G	2,000.00	39182	2,390.00
10 (3.0)	R10E	1,750.00	HR10G	2,650.00	39183	3,090.00
12 (3.7)	R12F	2,600.00	HR12F	3,840.00	39184	4,220.00
Extra Strength						
6 (1.8)	39191A	1,050.00	39196	1,960.00	—	—
8 (2.4)	39192	1,740.00	39197	2,625.00	—	—
10 (3.0)	39193	2,370.00	39198	3,300.00	—	—
12 (3.7)	39194	3,600.00	39199	4,740.00	—	—

Molded Radomes for Focal Plane Antennas — Page 83

Diameter ft. (m)	Unheated Type Number	Unheated Price $ U.S.	Heated, 3.56 Hz and Up Type Number	Heated, 3.56 Hz and Up Price $U.S.	Heated, 890-2700 MHz Type Number	Heated, 890-2700 MHz Price $ U.S.
Standard						
4 (1.2)	FR4	On App. B	FHR4	On App. B	—	—
6 (1.8)	FR6	On App. B	FHR6	On App. B	—	—
8 (2.4)	FR8	On App. B	FHR8	On App. B	102753	On App. B
10 (3.0)	FR10	On App. B	FHR10	On App. B	102755	On App. B
12 (3.7)	FR12	On App. B	FHR12	On App. B	102757	On App. B
Extra Strength						
4 (1.2)	FR4-E	On App. B	FHR4-E	On App. B	—	—
6 (1.8)	FR6-E	On App. B	FHR6-E	On App. B	—	—
8 (2.4)	FR8-E	On App. B	FHR8-E	On App. B	—	—
10 (3.0)	FR10-E	On App. B	FHR10-E	On App. B	—	—
12 (3.7)	FR12-E	On App. B	FHR12-E	On App. B	—	—

Special Application Molded Radomes — Page 83

For Antennas	Diameter ft. (m)	Unheated Type Number	Unheated Price $ U.S.	Heated Type Number	Heated Price $U.S.
PXL6-59D, PXL6-65D, PXL6-71E	6 (1.8)	35255-2	1,600.00	35254-2	2,040.00
Dual Pol. Std. 2700 MHz and Below	8 (2.4)	77025	2,680.00	—	—
Dual Pol. Std. 2700 MHz and Below	12 (3.7)	76496	4,290.00	—	—
P8-144E, PX8-144E	8 (2.4)	35257-41	2,140.00	35256-46	3,110.00
P10-144E, PX10-144E	10 (3.0)	35259-42	2,575.00	35258-47	3,860.00

Microwave Antenna Mounts* — Pages 86 and 87

For Antenna Size, ft. (m)	Type Number Inch Std. Hdwr.	Price $ U.S.	Type Number Metric Hdwr.	Price $ U.S.
Vertical Tower				
4, 6 (1.2, 1.8)	T6SB	320.00	T6MSB	On App. B
8, 10 (2.4, 3.0)	T10SB	590.00	T10MSB	On App. B
12 (3.7)	T12SA	930.00	T12MSA	On App. B
Horizontal Mount				
4-10 (1.2-3.0)	M10	185.00	M10M	On App. B
Vertical Tilt Mounts				
4, 6 (1.2, 1.8)	VT6B	440.00	VT6MB	On App. B
8, 10 (2.4, 3.0)	VT10	760.00	VT10M	On App. B
Horizontal Tilt Mounts				
4, 6 (1.2, 1.8)	HT6	600.00	HT6M	On App. B
8, 10 (2.4, 3.0)	HT10	1,250.00	HT10M	On App. B

*For replacement. A vertical mount is supplied with all parabolic antennas except UMX-459 series. B F.O.B. Lochgelly, Fife, Great Britain

Microwave Antennas *(continued)*

Optional Struts — Page 87

Type Number	Description	For Antenna Diameter, ft. (m)	Price $ U.S.	
For Solid Parabolic Antennas				
38891A	Side, inch std. hdwr.	4-12 (1.2-3.7)	170.00	
103720	Side, metric hdwr.	4-12 (1.2-3.7)	On App.	B
40604	Bottom, inch std. hdwr.	8-12 (2.4-3.7)	215.00	
100376	Bottom, metric hdwr.	8-12 (2.4-3.7)	On App.	B
For Grid Antennas				
75645-1	Side	6 (1.8)	175.00	
201632	Side	8 (2.4)	210.00	
201632-2	Side	10 (3.0)	210.00	
75645-3	Side	12 (3.7)	210.00	

SHX® Super High Performance Antennas and Accessories — Pages 88-91

Type Number	Description	Price $ U.S.	
SHX10B1	10 ft. (3 m) Horn-Reflector Antenna	On App.	O
SHX10C1	10 ft. (3 m) Horn-Reflector Antenna	On App.	O
48606	Wilson Bolt Assembly	115.00	O
49013	Support Plate WC166	140.00	O
96000	Shipping Skid	700.00 deposit	O
203105	WC281 to ⅞″ EIA Dual Pol. Transition	2,575.00	O
—	Other SHX Accessories	On App.	O

Rural Fixed Cellular Antennas — Page 93:

On Application

F.O.B. Campbellfield, Victoria, Australia

Nodal Antennas — Page 93

Type Number	Polarization	Price $ U.S.	
104140	Vertical	4,500.00	B
104141	Horizontal	4,500.00	B

Earth Station Antennas — Pages 94-132:

Contact Andrew for Quotation

Broadcast Antennas — Pages 133-143

F.O.B. Orland Park, Illinois except where otherwise specified.

TRASAR® Television Transmitting Antennas — Pages 133-141:

Contact Andrew for Quotation

MDS Transmitting Antennas — Page 142

Type Number	Polarization	Azimuth Pattern	Price $ U.S.
Medium Gain			
62422	Vertical	Omni	1,640.00
62423	Vertical	Cardioid	1,970.00
63152	Horizontal	Omni	2,480.00
63500	Horizontal	Cardioid	2,850.00
High Gain			
63159	Vertical	Omni	5,900.00
63502A	Vertical	Cardioid	6,100.00
63160	Horizontal	Omni	6,400.00
63503	Horizontal	Cardioid	7,700.00

Power Dividers — Page 142

Type Number	Frequency MHz	Price $ U.S.
62795	2150-2163	175.00
64104	2150-2163	450.00
58249	2500-2700	850.00

ITFS and MMDS Transmitting Antennas — Page 143

		42 MHz Bandwidth Antennas		Wide Band Antennas	
Polarization	Azimuth Pattern	Type Number	Price $ U.S.	Type Number	Price $ U.S.
H	Omni	HMD8HO	4,330.00	HMD8HO-W	4,980.00
H	Omni	HMD12HO	6,720.00	HMD12HO-W	7,730.00
H	Omni	HMD16HO	9,470.00	HMD16HO-W	10,890.00
H	Cardioid	HMD8HC	4,330.00	HMD8HC-W	4,980.00
H	Cardioid	HMD12HC	6,720.00	HMD12HC-W	7,730.00
H	Cardioid	HMD16HC	9,470.00	HMD16HC-W	10,890.00
H	Cardioid	HMD24HC	15,350.00	HMD24HC-W	17,650.00
H	Cardioid	HMD32HC	21,000.00	HMD32HC-W	24,150.00
V	Omni	HMD8VO	4,330.00	HMD8VO-W	4,980.00
V	Omni	HMD12VO	6,720.00	HMD12VO-W	7,730.00
V	Omni	HMD16VO	9,470.00	HMD16VO-W	10,890.00
V	Cardioid	HMD8VC	4,330.00	HMD8VC-W	4,980.00
V	Cardioid	HMD12VC	6,720.00	HMD12VC-W	7,730.00
V	Cardioid	HMD16VC	9,470.00	HMD16VC-W	10,890.00
V	Cardioid	HMD24VC	15,350.00	HMD24VC-W	17,650.00
V	Cardioid	HMD32VC	21,000.00	HMD32VC-W	24,150.00

ITFS and MMDS Receiving Antennas — Page 143

Type Number	Diameter ft. (m)	Price $ U.S.		Radome Type No.	Price $ U.S.	
49001A	2 (0.6)	580.00	D	R2D	250.00	D
49002	4 (1.2)	1,050.00	D	R4D	440.00	D
49003	6 (1.8)	1,340.00	D	R6D	635.00	D

Government and Military Antennas — Pages 144-176

HF Products — Pages 144-171:

Contact Andrew for Quotation

F.O.B. Lochgelly, Fife, Great Britain

Custom Designed Antennas — Pages 172, 173:

Contact Andrew for Quotation

F.O.B. Whitby, Ontario, Canada

Special Application Antennas — Pages 174-176

F.O.B. Whitby, Ontario, Canada

Type Number	Description	Price $ U.S.
63305A-5	Bifilar Helical	6,000.00
Contact Andrew for quotaton on other special application antennas.		

B F.O.B. Lochgelly, Fife, Great Britain D F.O.B. Denton, Texas O F.O.B. Orland Park, Illinois

HELIAX® Elliptical Waveguides and Components — Pages 180-195

F.O.B. Orland Park, Illinois

HELIAX® Elliptical Waveguide Assemblies, Super Premium — Page 185

Super Premium Type Number	Waveguide Price $ U.S.	Connector Type Number	Mates with	Price $ U.S.
EWP37S	19.40/ft.	137DET	CPR229G	375.00
EWP52S	16.00/ft.	152DET	CPR159G	335.00
		252DCT	UG-343B/U, UG-344/U	325.00
		252DET	CPR137G	330.00
EWP63S	14.10/ft.	163DCT	UG-343B/U, UG-344/U	215.00
		163DET	CPR137G	225.00
EWP90S	12.80/ft.	190DET	CPR90G	240.00

HELIAX Elliptical Waveguide Assemblies, Premium — Pages 186 and 187

Premium Type Number	Waveguide Price $ U.S.	Connector Type Number	Mates with	Price $ U.S.
EWP17	29.70/ft.	117ET	CPR430G	1,050.00
		117RT	⅞″ EIA, gas barrier	1,070.00
		117RT-3	⅞″ EIA, no gas barrier	1,050.00
EWP34	19.70/ft.	134DET	CPR229G	440.00
		134DEP-2	CPR229G	440.00
		134DEP-1	CPR229G	440.00
EWP37	18.40/ft.	137DET	CPR229G	375.00
		137DEP-2	CPR229G	375.00
		137DEP-1	CPR229G	375.00
EWP44	15.90/ft.	144DCT	UG-148/U, UG-149/U	340.00
		144DET	CPR187G	345.00
		144DEP-1	CPR187G	345.00
EWP52	15.00/ft.	152DET	CPR159G	335.00
		152DEP-1	CPR159G	335.00
		252DCT	UG-343B/U, UG-344/U	325.00
		252DET	CPR137G	330.00
		252DEP-1	CPR137G	330.00
EWP63	13.10/ft.	163DCT	UG-343B/U, UG-344/U	215.00
		163DCP-1	UG-343B/U, UG-344/U	215.00
		163DCP-2	UG-343B/U, UG-344/U	215.00
		163DET	CPR137G	225.00
		163DEP-1†	CPR137G	225.00
		163DEP-2	CPR137G	225.00
EWP64	13.00/ft.	164DCT	UG-343B/U, UG-344/U	215.00
		164DCP-1	UG-343B/U, UG-344/U	225.00
		164DET	CPR137G	225.00
		164DEP-1	CPR137G	225.00
		264DET	CPR112G	260.00
		264DEP-1	CPR112G	260.00
EWP77	12.80/ft.	177DCT	UG-52B/U, UG-51/U	230.00
		177DCP-1	UG-52B/U, UG-51/U	230.00
		177DCP-2	UG-52B/U, UG-51/U	230.00
		177DET	CPR112G	240.00
		177DEP-1	CPR112G	240.00
		177DEP-2	CPR112G	240.00
EWP90	11.80/ft.	190DET	CPR90G	240.00
		190DEP-2	CPR90G	240.00
		190DEP-1	CPR90G	240.00
		290SC	WR75 choke or cover	260.00
EWP127A	10.70/ft.	1127DCT	WR75 choke or cover	225.00
		1127DCP-3	WR75 choke or cover	225.00
		1127DET	PDR120	235.00
		1127DEP-3	PDR120	235.00
		1127DKT	Press, Contact	250.00
EWP132	10.70/ft.	2132DCT	WR75 choke or cover	295.00
		2132DCP-1	WR75 choke or cover	295.00
		2132DKT	Press, Contact	310.00
		2132DET	PDR120	295.00
		2132DEP-1	PDR120	295.00
		1132DCT	UG-419/U, UG-541/U	260.00
		1132DET	PDR140	260.00
		1132DEP-1	PDR140	260.00
EWP180	8.65/ft.	1180DCT	UG-595/U, UG-596A/U	250.00
		1180DCP-1	UG-595/U, UG-596A/U	250.00
EWP220	8.40/ft.	1220ASC	UG-595/U, UG-596A/U	200.00

HELIAX Elliptical Waveguide Assemblies, Standard — Pages 188 and 189

Standard Type Number	Waveguide Price $ U.S.	Connector Type Number	Mates with	Price $ U.S.*
EW17	28.00/ft.	117E	CPR430G	1,020.00
EW20	22.80/ft.	120E	CPR340G	980.00
		120R	⅞″ EIA, gas barrier	1,080.00
		120R-3	⅞″ EIA, no gas barrier	1,060.00
EW28	20.40/ft.	128AE	CPR284G	740.00
EW34	18.20/ft.	134DE	CPR229G	425.00
EW37	16.70/ft.	137DE	CPR229G	355.00
EW44	14.50/ft.	144DC	UG-148/U, UG-149/U	325.00
		144DE	CPR187G	330.00
EWS44	19.70/ft.	144DC-3	UG-148/U, UG-149/U	325.00
		144DE-3	CPR187G	330.00
EW52	13.50/ft.	152DE	CPR159G	320.00
		252DC	UG-343B/U, UG-344/U	310.00
		252DE	CPR137G	315.00
EW63	11.80/ft.	163DC	UG-343B/U, UG-344/U	200.00
		163DE	CPR137G	210.00
EW64	11.75/ft.	164DC	UG-343B/U, UG-344/U	200.00
		164DE	CPR137G	210.00
		264DE	CPR112G	235.00
EW77	11.60/ft.	177DC	UG-52B/U, UG-51/U	215.00
		177DE	CPR112G	225.00
EW85	10.30/ft.	185AC	UG-40B/U, UG-39/U	180.00
EW90	10.60/ft.	190DE	CPR90G	225.00
		290SC	WR75 choke or cover	260.00
EW127A	9.50/ft.	1127DC	WR75 choke or cover	210.00
		1127DE	PDR120	220.00
		1127DK	Press, Contact	225.00
EW132	9.50/ft.	2132DC	WR75 choke or cover	280.00
		2132DE	PDR120	280.00
		2132DK	Press, Contact	295.00
		1132DC	UG-419/U, UG-541/U	245.00
		1132DE	PDR140	245.00
EW180	7.65/ft.	1180DC	UG-596A/U, UG-595/U	235.00
EW220	7.40/ft.	1220ASC	UG-596A/U, UG-595/U	200.00

*For standard waveguide assemblies 50 ft. (15 m) or less, add $20.00 per connector attachment.

†New Product.

HELIAX® Elliptical Waveguide Accessories — Pages 190-193

	EW17 EWP17	EW20	EW28	EW34 EWP34	EW37 EWP37 EWP37S	EW44 EWP44
Flaring Tool Kit	—	—	—	—	205869 $ 900.00	206135 $ 900.00
Hanger Kit of 10	31766-9 $ 70.00	31766-10 $ 62.00	31766-11 $ 56.00	42396A-15 $ 40.00	42396A-4 38.00	42396A-2 38.00
Grounding Kit	204989-6 37.00	204989-6 37.00	204989-5 26.00	204989-5 26.00	204989-5 26.00	204989-4 25.00
Splice	117Z 980.00	120Z 940.00	128AZ 870.00	134DZ 450.00	137DZ 380.00	144DZ 380.00
Hoisting Grip	34759 75.00	34759 75.00	26985A 73.00	26985A 73.00	31535 53.00	24312A 47.50
Bending Tool Kit	33586-4 1,060.00	33586-4 1,060.00	33586-5 500.00	33586-11 355.00	33586-3 280.00	33586-3 280.00
Connector Reattachment Kit	33544-10 65.00	33544-11 39.00	— —	33544-43 20.00	33544-24 17.70	33544-32 18.00
Wall/Roof Feed Thru	35849-10 125.00	35849-9 115.00	35849-13 120.00	35849-17 94.00	35849-8 80.00	35849-7 78.00
Waveguide Boot, 4 in.	— —	— —	— —	204679-34 65.00	204679-37 65.00	204679-44 65.00
Waveguide Boot, 5 in.	— —	— —	— —	48939-34 72.00	48939-37 72.00	48939-44 72.00

HELIAX Elliptical Waveguide Accessories — Pages 190-193

	EWS44	EW52 EWP52 EWP52S	EW63 EWP63 EWP63S	EW64 EWP64	EW77 EWP77	EW85
Flaring Tool Kit	206135-2 $900.00	204897 $900.00	204677 $900.00	202358 $900.00	202421 $900.00	— —
Hanger Kit of 10	42396A-2 $ 38.00	42396A-8 38.00	42396A-7 38.00	42396A-1 38.00	42396A-11 38.00	42396A-5 38.00
Grounding Kit	204989-4 25.00	204989-4 25.00	204989-4 25.00	204989-3 25.00	204989-3 25.00	204989-2 24.00
Splice	144DZ 380.00	152DZ 270.00	163DZ 245.00	164DZ 245.00	177DZ 250.00	185AZ 265.00
Hoisting Grip	24312A 47.50	24312A 47.50	24312A 47.50	29961 38.50	19256B 38.50	29958 38.50
Bending Tool Kit	33586-3 280.00	33586-7 240.00	33586-8 230.00	33586-2 230.00	33586-9 230.00	33586-1 230.00
Connector Reattachment Kit	33544-32 18.00	33544-38 13.00	33544-33 13.00	33544-35 13.00	33544-34 13.00	33544-17 16.00
Wall/Roof Feed Thru	35849-7 78.00	35849-14 78.00	35849-6 78.00	35849-12 76.00	35849-16 76.00	35849-3 70.00
Waveguide Boot, 4 in.	204679-44 65.00	204679-52 65.00	204679-63 65.00	204679-64 65.00	204679-77 65.00	— —
Waveguide Boot, 5 in.	48939-44 72.00	48939-52 72.00	48939-63 72.00	48939-64 72.00	48939-77 72.00	— —

HELIAX Elliptical Waveguide Accessories — Pages 190-193

	EW90 EWP90 EWP90S	EW127A EWP127A	EW132 EWP132	EW180 EWP180	EW220 EWP220
Flaring Tool Kit	204919 $850.00	204960 $900.00	203809 $900.00	201439 $900.00	205127 $800.00
Hanger Kit of 10	42396A-5 38.00	42396A-9 38.00	42396A-9 38.00	43211 29.00	43211 29.00
Grounding Kit	204989-2 24.00	204989-2 24.00	204989-2 24.00	204989-1 19.00	204989-1 19.00
Splice	190DZ 235.00	1127DZ 225.00	1132DZ 280.00	1180DZ 205.00	1220DZ 180.00
Hoisting Grip	29958 38.50	29958 38.50	29958 38.50	43094 27.00	43094 27.00
Bending Tool Kit	33586-1 230.00	33586-1 230.00	33586-1 230.00	33586-1 230.00	33586-1 230.00
Connector Reattachment Kit	33544-37 13.00	33544-41 12.70	33544-39 16.50	33544-42 18.50	33544-44 13.00
Wall/Roof Feed Thru	35849-15 70.00	35849-1 70.00	35849-11 70.00	35849-18 67.00	35849-19 62.00
Waveguide Boot, 4 in.	204679-90 65.00	204679-127 65.00	204679-132 65.00	204679-180 65.00	204679-220 65.00
Waveguide Boot, 5 in.	48939-90 72.00	48939-122 72.00	48939-132 72.00	48939-180 72.00	48939-220 72.00

Hardware and Angle Adaptor Kits of 10 — Pages 190 and 191

Type Number	Description	Price $ U.S.
31769-5	Hardware Kit, ⅜"×¾" Long	12.00
31769-1	Hardware Kit, ⅜"×1" Long	12.50
31768A	Angle Adaptor	57.00
42334	45° Adaptor	42.00

Threaded Rod Support Kit — Page 191

Rod Length, in. (mm)	Kit of 1 Type Number	Kit of 1 Price $ U.S.	Kit of 5 Type Number	Kit of 5 Price $ U.S.
12 (305)	31771	14.00	31771-4	70.00
24 (610)	31771-9	20.00	31771-6	100.00

Round Member Adaptor — Page 191

Member Diameter, in. (mm)	Type Number	Price $ U.S.
1-2 (25-50)	31670-1	20.80
2-3 (50-75)	31670-2	23.00
3-4 (75-100)	31670-3	26.50
4-5 (100-125)	31670-4	27.00
5-6 (125-150)	31670-5	27.50

Tower Standoff Kit of 10 — Page 191

Member Diameter in. (mm)	1 in. (25 mm) Standoff Type Number	1 in. (25 mm) Standoff Price $ U.S.	2.5 in. (60 mm) Standoff Type Number	2.5 in. (60 mm) Standoff Price $ U.S.
0.75-1.5 (20-40)	30848-5	98.00	—	—
1.5-3.0 (40-75)	30848-4	100.00	—	—
3-4 (75-100)	30848-1	125.00	41108A-1	140.00
4-5 (100-125)	30848-2	125.00	41108A-2	140.00
5-6 (125-150)	30848-3	128.00	41108A-3	145.00

Multiple Entrance Wall/Roof Feed-Thru Plate — Page 193

Number of Openings	Type Number	Price $ U.S.	Number of Openings	Type Number	Price $ U.S.
4 in. (102 mm) Diameter Entry Opening			**5 in. (127 mm) Diameter Entry Opening**		
1	204673-1	41.50	1	48940-1	46.00
1	204673-2	41.50	2	48940-2	108.00
4	204673-4	155.00	3	48940-3	135.00
8	204673-8	245.00	4	48940-4	168.00
			6	48940-6	228.00

Pressure Windows, Flex-Twist Sections and Flange Gaskets — Page 194

Flange Types	Pressure Windows Type Number	Pressure Windows Price $ U.S.	2 ft. (0.6 m) Flex-Twist Sections Type Number	2 ft. (0.6 m) Flex-Twist Sections Price $ U.S.	Full Flange Gasket Type Number	Full Flange Gasket Price $ U.S.	Half Flange Gasket Type Number	Half Flange Gasket Price $ U.S.
CPR340G	55001-340	135.00	—	—	32457-2	17.50	55072-340	16.50
CPR284G	55001-284	94.00	—	—	40611	12.00	55072-284	9.40
CPR229G	55001-229	47.00	55421-24	595.00	31619	6.50	55072-229	6.40
UG-148/U, UG-149/U	55000-187	36.00	52095-24	450.00	10683-307	3.30	—	—
CPR187G	55001-187	47.00	55419-24	575.00	55688	5.40	55072-187	5.60
CPR159G	55001-159	47.00	55417-24	500.00	54769	4.20	55072-159	4.40
UG-343B/U, UG-344/U	55000-137	36.00	19075-24	290.00	10683-304	2.50	—	—
CPR137G	55001-137	47.00	55415-24	405.00	28030	4.70	55072-137	4.60
UG-52B/U, UG-51/U	55000-112	36.00	51727-24	280.00	10683-305	3.00	—	—
CPR112G	55001-112	47.00	55413-24	395.00	32349	4.40	55072-112	4.40
UG-40B/U, UG-39/U	55000-90	36.00	51737-24	270.00	10683-329	2.10	—	—
CPR90G	55001-90	47.00	55411-24	350.00	31861	4.40	55072-90	4.40
WR75 Choke/Cover	55000-75	36.00	51747-24	295.00	10683-312	2.00	—	—
UG-419/U, UG-541/U	55000-62	36.00	53215-24	335.00	10683-319	2.10	—	—
UG-596A/U, UG-595/U	55000-42	36.00	163619-24	350.00	10683-328	2.00	—	—

HELIAX® Elliptical Waveguide Twist Assemblies — Page 194

Frequency Band, GHz	Type No.	Connectors Mate With U.S.	Connectors Mate With IEC	Price $ U.S.	Grounding Kit Type No.	Price $ U.S.
5.925-6.425	44730-1	CPR137G	PDR70	960.00	204989-3	25.00
6.425-7.125	44730-1	CPR137G	PDR70	960.00	204989-3	25.00
7.725-8.5	44978-1	CPR112G	PDR84	940.00	204989-3	25.00
10.7-11.7	45029	CPR90G	PDR100	940.00	204989-2	24.00
12.7-13.25	44910-1	WR75 choke or cover		940.00	204989-2	24.00

Elliptical Waveguide Sliding Loads — Page 195

Waveguide Type	Type Number	Price $ U.S.
EW37	40502-37	350.00
EW44	40502-44	350.00
EW52	40502-52	350.00
EW63	40502-63	350.00
EW90	40502-90	350.00

Hybrid T Reflectometers — Page 195:
Priced on Application

Circular Waveguides and Components — Pages 196-201
F.O.B. Orland Park, Illinois

Circular Waveguide Straight Sections — Page 196

Length	Flanges	WC281	WC269	WC205	WC166	WC109
20 ft.	Fixed	—	64269-240 $1,020.00	53988-240 $800.00	49608-240 $665.00	54346-240 $395.00
12 ft., 6¼ in.	Fixed	48600A-1 $590.00	—	—	68573-166 585.00	—
	Swivel/Fixed	48600A-2 665.00	—	—	68574-166 645.00	—
12 ft., 6 in.	Fixed	49607-150 585.00	—	—	49608-150 530.00	—
	Swivel/Fixed	48613A-150 635.00	—	—	69021-150 590.00	—
8 ft.	Swivel/Fixed	48613A-96 565.00	65456-96 730.00	—	69021-96 510.00	—
2 ft.	Swivel/Fixed	—	65456-24 610.00	53987-24 465.00	69021-24 435.00	54345-24 275.00
Special	Fixed	49607 375.00 +21.50/ft.	64269 495.00 +29.50/ft.	53988 385.00 +22.00/ft.	49608 380.00 +17.50/ft.	54346 220.00 +10.20/ft.
	Swivel/Fixed	48613A 445.00 +21.50/ft.	65456 575.00 +29.50/ft.	53987 465.00 +22.00/ft.	69021 430.00 +17.50/ft.	54345 270.00 +10.20/ft.

Prices by Product Category

Circular-to-Rectangular Waveguide Transitions — Page 197

	Single Pol. With Mode Filter		Single Pol. No Mode Filter		Dual Pol. With Mode Filter		Dual Pol. No Mode Filter	
Frequency Band, GHz	Type No.	Price $ U.S.	Type No.	Price $ U.S.	Type No.	Price $ U.S.	Type No.	Price $ U.S.
WC281								
3.700-4.200	—	—	—	—	—	—	69385	2,160.00
WC269								
3.700-4.200	65325	1,500.00	64274A	1,130.00	65326	2,290.00	64270A	1,900.00
WC205								
5.925-6.425	65234-3	1,300.00	53990A-3	915.00	65233-1	1,565.00	64137A-1	1,380.00
5.925-6.425	—	—	—	—	65235	1,565.00	64136A	1,380.00
5.925-6.425	65234-1	1,300.00	53990A-1	915.00	65233-2	1,565.00	64137A-2	1,380.00
WC166								
5.925-6.425	65239-3	1,210.00	58016A-3	990.00	65236-1	1,380.00	62866A-1	1,215.00
5.925-6.425	—	—	—	—	65237-1	1,380.00	64159A-1	1,215.00
5.925-6.425	65239-1	1,210.00	58016A-1	990.00	65236-2	1,380.00	62866A-2	1,215.00
6.425-7.125	65240-1	1,210.00	64157A-1	990.00	65238-1	1,380.00	64147A-1	1,215.00
6.425-7.125	65240-2	1,210.00	64157A-2	990.00	65238-2	1,380.00	64147A-2	1,215.00
7.125-7.750	65322-1	1,210.00	65321A-1	990.00	65324-1	1,380.00	64848A-1	1,215.00
7.125-7.750	65322-2	1,210.00	65321A-2	990.00	65324-2	1,380.00	64848A-2	1,215.00
7.725-8.500	65323-3	1,210.00	57459A-3	990.00	65316-1	1,380.00	64703A-1	1,215.00
7.725-8.500	65323-2	1,210.00	57459A-2	990.00	65316-2	1,380.00	64703A-2	1,215.00
10.700-11.700	—	—	—	—	—	—	69383	1,215.00
WC109								
10.700-11.700	65242-107	960.00	57222A-107	730.00	65241-107	1,160.00	64100A-107	975.00
12.200-12.700	65242-122	960.00	57222A-122	730.00	65241-122	1,160.00	64100A-122	975.00
12.700-13.250	—	—	—	—	69876	1,160.00	69877	975.00
12.700-13.250	67550	960.00	67549	740.00	68999	1,160.00	68998	975.00
17.700-19.700	—	—	—	—	160515-177	1,500.00	160516-177	1,500.00

Taper Transitions — Page 198

From	To	Transition Type No.	Price $ U.S.
Circular-to-Circular Waveguide			
WC281 Swivel	WC269	69273	850.00
WC281 Swivel	WC212	49545	860.00
WC281 Swivel	WC205	69272	850.00
WC281 Swivel	WC166	69271	850.00
WC281 Swivel	WC109	69269	900.00
WC269 Swivel	WC212	69492	850.00
WC269 Swivel	WC166	69270	850.00
WC166	WC109	69277	850.00
WC166	WC75	69382	850.00
WC109	WC75	55648	435.00
Circular-to-Square Waveguide			
WC281	WS176	202559	1,070.00
WC166	WS108	205137	1,045.00

Horn-Reflector System Mode Filters — Page 199

Bottom Flange	Frequency Bands, GHz	Type Number	Price $ U.S.
WC281	3.6-4.2, 5.925-6.425	69907	2,390.00
WC281	3.6-4.2, 6.425-7.125	69908	2,390.00
WC281	5.925-6.425, 10.7-11.7	162240	2,180.00
WC269	3.6-4.2, 5.925-6.425	69485	2,180.00
WC166	5.925-6.425, 10.7-11.7	69910	2,180.00

Circular Waveguide Accessories — Pages 198-201

Type Number	Description	Price $ U.S.
69585-18	Swivel Flange Adaptor	420.00
48001	Network Drain Kit	On App.
48001-2	Network Drain Kit	On App.
25435-5	⅜″ Tubing	0.35/ft.
40417	Tie Wraps	31.20
49486	Current By-Pass Kit	11.75
48608	WC281 Alignment Tool	115.00
48607	WC281 Flange Wrench	405.00
13555A	Angle Adaptor	18.00
65500	Round Member Adaptor	960.00
200970	EW Sliding Support	88.00
205995	Water Trap Adaptor	62.00

Compact 4-Port Combining Networks — Page 198: Priced on Application

Termination Loads — Page 199

Mates with Flange Type(s)	Load Type No.	Price $ U.S.
CPR90G	62901-90	150.00
CPR112G	62901-112	160.00
CPR137G	62901-137	165.00
CPR137G	39099-137A	46.00
CPR159G	62901-159	230.00
CPR229G	62901-229	250.00
CPR229G	200807	105.00
WR75 Choke or Cover	62900-75	150.00
UG-52/U or UG-51/U	62900-112	150.00
UG-343B/U or UG-344/U	62900-137	150.00

Circular Waveguide Accessories — Pages 199-201

	WC281	WC269	WC205	WC166	WC109
Alignment Shorting Plate	64382 $ 58.00	64272 $ 58.00	54827 $ 45.00	57569 $ 47.00	56207 $ 45.00
Pulling Head	64775-281 232.00	64775-269 285.00	64775-205 248.00	64775-166 225.00	64775-109 215.00
Flange Hardware Kit	48614 22.00	64412 9.30	53896 8.75	57570-1 8.50	54109 8.75
Axial Ratio Compensator	48609 380.00	64271 160.00	54762 128.00	57568 128.00	54348 110.00
Hanger, Rigid	— —	19007A-269 67.00	19007A-205 62.00	69932 41.00	19007A-109 41.00
Hanger, Sliding	— —	— —	— —	69933 35.00	19008A-109 35.00
Hanger, Spring/Sliding	— —	19009A-269 82.00	19009A-205 80.00	69934 74.00	19009A-109 74.00

Sliding Restrainer Type Numbers — Page 200

Size	18 in. (460 mm)	30 in. (760 mm)	Bottom
WC281	48602 $135.00	48603 $175.00	48604 $135.00
WC166	49008 115.00	49009 155.00	49010 145.00

Rectangular Waveguides and Components —
Pages 202-209
F.O.B. Orland Park, Illinois

High Power Components for ESA — Page 203

	WR137	WR75
Flex-Twist Section		
1 ft. (0.3 m)	162047-12 $390.00	163228-12 $360.00
2 ft. (0.6 m)	162047-24 435.00	163228-24 400.00
3 ft. (0.9 m)	162047-36 500.00	163228-36 465.00
Flex (No Twist) Section		
1 ft.	162048-12 600.00	162615-12 565.00
2 ft.	162048-24 $645.00	162615-24 $615.00
3 ft.	162048-36 700.00	162615-36 670.00
Pressure Window		
1000 Watt	202378 On App.	
2000 Watt	—	202378-3 On App.
5000 Watt	202378-2 On App.	

Rectangular Waveguide Components — Low VSWR — Page 205

Waveguide EIA IEC British	WR229 R40 WG11A	WR187 R48 WG12	WR159 R58 WG13	WR137 R70 WG14	WR112 R84 WG15	WR90 R100 WG16
Flanges	CPR229G	CPR187G	CPR159G	CPR137G	CPR112G	CPR90G
Straight Section 5 ft. (1.5 m)	55420-60 $490.00	55418-60 $330.00	55416-60 $250.00	55414-60 $205.00	55412-60 $210.00	55410-60 $175.00
10 ft. (3.0 m)	55420-120 655.00	55418-120 400.00	55416-120 350.00	55414-120 240.00	55412-120 245.00	55410-120 225.00
Special Length	55420 345.00 +34.00/ft.	55418 275.00 +15.00/ft.	55416 260.00 +12.00/ft.	55414 165.00 +10.50/ft.	55412 165.00 +10.50/ft.	55410 160.00 +10.50/ft.
1 ft. (0.3 m) Flex-Twist	55421-12 530.00	55419-12 520.00	55417-12 440.00	55415-12 355.00	55413-12 340.00	55411-12 295.00
2 ft. (0.6 m) Flex-Twist	55421-24 595.00	55419-24 575.00	55417-24 500.00	55415-24 405.00	55413-24 395.00	55411-24 350.00
3 ft. (0.9 m) Flex-Twist	55421-36 685.00	55419-36 635.00	55417-36 530.00	55415-36 465.00	55413-36 460.00	55411-36 400.00
90° E-Plane Elbow	55402-229 485.00	55402-187 340.00	55402-159 245.00	55402-137 205.00	55402-112 205.00	55402-90 200.00
90° H-Plane Elbow	55403-229 485.00	55403-187 340.00	55403-159 245.00	55403-137 205.00	55403-112 205.00	55403-90 200.00
90° Twist	55407-229 485.00	55407-187 340.00	55407-159 245.00	55407-137 205.00	55407-112 205.00	55407-90 200.00
Premium 90° Step-Twist	65230-229-1 325.00	— —	65230-159 275.00	65230-137 245.00	— —	— —
2 ft. (0.6 m) Premium Flex (No Twist)	— —	— —	— —	65168-24 575.00	— —	— —
Pressure Inlet	55674-229 150.00	55674-187 150.00	55674-159 110.00	55674-137 105.00	55674-112 105.00	55674-90 105.00
Pressure Window	55001-229 47.00	55001-187 47.00	55001-159 47.00	55001-137 47.00	55001-112 47.00	55001-90 47.00
Field Flange	56045-229 210.00	56045-187 180.00	56045-159 112.00	56045-137 112.00	56045-112 112.00	56045-90 112.00
Flange Hardware Kit	55219-229 15.40	55219-187 13.40	55219-159 13.40	55219-137 13.00	55219-112 13.40	55219-90 13.40
Flange Gasket, Full	31619 6.50	55688 5.40	54769 4.20	28030 4.70	32349 4.40	31861 4.40
Flange Gasket, Half	55072-229 6.40	55072-187 5.60	55072-159 4.40	55072-137 4.60	55072-112 4.40	55072-90 4.40

ANDREW

Rectangular Waveguide Components — Standard — Page 205

Waveguide Size EIA IEC British Frequency Band, GHz	WR187 R48 WG12 3.95-5.85	WR137 R70 WG14 5.8-8.2	WR112 R84 WG15 7.05-10.0	WR90 R100 WG16 8.2-12.4	WR75 R120 WG17 10.0-15.0	WR62 R140 WG18 12.4-18.0	WR42 R220 WG20 17.7-26.5
Flanges, Choke Cover	UG-148C/U UG-149A/U	UG-343B/U UG-344/U	UG-52B/U UG-51/U	UG-40B/U UG-39/U	Choke Cover	UG-541A/U UG-419/U	UG-596A/U UG-595/U
Straight Section 5 ft. (1.5 m)	52080-60 $225.00	19065-60 $150.00	19045-60 $150.00	19051-60 $145.00	51741-60 $150.00	53210-60 $130.00	53296-60 $130.00
10 ft. (3.0 m)	52080-120 290.00	19065-120 185.00	19045-120 185.00	19051-120 175.00	51741-120 185.00	53210-120 160.00	53296-120 170.00
Special Length	52080 180.00 +15.00/ft.	19065 125.00 +8.75/ft.	19045 125.00 +8.75/ft.	19051 120.00 +8.75/ft.	51741 125.00 +8.75/ft.	53210 100.00 +8.75/ft.	53296 95.00 +8.75/ft.
1 ft. (0.3 m) Flex-Twist	52095-12 385.00	19075-12 235.00	51727-12 225.00	51737-12 215.00	51747-12 255.00	53215-12 290.00	163619-12 320.00
2 ft. (0.6 m) Flex-Twist	52095-24 450.00	19075-24 290.00	51727-24 280.00	51737-24 270.00	51747-24 295.00	53215-24 335.00	163619-24 350.00
3 ft. (0.9 m) Flex-Twist	52095-36 505.00	19075-36 335.00	51727-36 330.00	51737-36 325.00	51747-36 340.00	53215-36 385.00	163619-36 400.00
90° E-Plane Elbow	55220-187 205.00	55220-137 140.00	55220-112 128.00	55220-90 128.00	55220-75 115.00	55220-62 115.00	55220-42 145.00
90° H-Plane Elbow	55221-187 205.00	55221-137 140.00	55221-112 128.00	55221-90 128.00	55221-75 115.00	55221-62 115.00	55221-42 145.00
90° Twist Section	55222-187 205.00	55222-137 150.00	55222-112 145.00	55222-90 145.00	55222-75 135.00	55222-62 135.00	55222-42 150.00
Pressure Inlet	55675-187 118.00	55675-137 102.00	55675-112 88.00	55675-90 88.00	55675-75 88.00	55675-62 88.00	55675-42 88.00
Pressure Window	55000-187 36.00	55000-137 36.00	55000-112 36.00	55000-90 36.00	55000-75 36.00	55000-62 36.00	55000-42 36.00
Pressure Window/Inlet	53648-187 168.00	53648-137 168.00	53648-112 144.00	53648-90 134.00	53648-75 122.00	53648-62 132.00	53648-42 152.00
Field Choke Flange	53015-187 162.00	53015-137 98.00	53015-112 142.00	53015-90 130.00	53015-75 122.00	53015-62 132.00	53015-42 160.00
Field Cover Flange	53025-187 130.00	53025-137 86.00	53025-112 120.00	53025-90 110.00	53025-75 102.00	53025-62 122.00	53025-42 146.00
Flange Hardware Kit	55224-187 6.40	55224-137 5.00	55224-112 5.00	55224-90 5.00	55224-75 5.10	55224-62 5.10	55224-42 4.90
Flange Gasket	10683-307 3.30	10683-304 2.50	10683-305 3.00	10683-329 2.10	10683-312 2.00	10683-319 2.10	10683-328 2.00

Flange Adaptor — Page 206

Flange Type and	Flange Type	Type Number	Price $ U.S.
UG-51/U	CPR112G	55526-4	115.00
UG-52B/U	CPR112G	55974-4	125.00
UG-343B/U or -344	CPR137G	55249-4	125.00
CMR90	CPR90G	55437-90	152.00
CMR112	CPR112G	55437-112	152.00
CMR137	CPR137G	55437-137	152.00
CMR159	CPR159G	55437-159	158.00
CMR229	CPR229G	55437-229	225.00

Transition to N Jack — Page 206

Waveguide	Flange Type	Type Number	Price $ U.S.
WR229	CPR229G	54418-229	350.00
WR229	CPR229G	163950-229	380.00
WR159	CPR159G	54418-159	300.00
WR159	CPR159G	163950-159	330.00
WR137	CPR137G	54418-137	285.00
WR137	CPR137G	163950-137	310.00
WR137	UG-344/U	59210-137	265.00
WR112	CPR112G	54418-112	285.00
WR112	CPR112G	163950-112	310.00
WR112	UG-51/U	59210-112	260.00
WR90	CPR90G	54418-90	285.00
WR90	CPR90G	163950-90	310.00
WR90	UG-39/U	59210-90	260.00
WR75	WR75 cover	59210-75	260.00

Prices by Product Category

Tapered Transition — Page 206

One Flange Mates With	Other Flange Mates With	Type Number	Price $ U.S.
UG-148C/U UG-149A/U	CPR137G	59220-24	240.00
CPR159G	CPR137G	59220-37	170.00
CPR159G	UG-343B/U UG-344/U	59220-30	145.00
CMR159	CMR137	59220-100	160.00
CPR137G	CPR112G	59220-33	170.00
CPR137G	UG-52B/U UG-51/U	59220-25	155.00
UG-343B/U UG-344/U	UG-52B/U UG-51/U	59220-5	155.00
UG-52B/U UG-51/U	UG-40B/U UG-39/U	59220-6	170.00
CPR90G	WR75 choke or cover	59220-51	170.00
UG-40B/U UG-39/U	WR75 choke or cover	59220-13	120.00

Two-Way Power Dividers — New Product

Waveguide Type	Frequency Band, GHz	Flanges Mate With	Type Number	Price $ U.S.
WR62	14.4-15.0	UG419/U, UG-541A/U	62831-144	600.00
WR75	12.2-12.7	WR75 Choke or Cover	62832-122	600.00
WR75	12.7-13.2	WR75 Choke or Cover	62832-127	600.00
WR90	10.7-11.7	UG-39/U, UG-40B/U	62833-107	600.00
WR90	10.7-11.7	CPR90G	62842-107	600.00
WR112	7.125-7.750	UG-51/U, UG-52/U	62834	600.00
WR112	7.125-7.750	CPR112G	62843-71	600.00
WR137	5.925-6.425	UG-344/U, UG-343B/U	62835-59	600.00
WR137	6.425-7.125	UG-344/U, UG-343B/U	62835-64	600.00
WR137	5.925-6.425	CPR137G	62844-59	600.00
WR137	6.425-7.125	CPR137G	62844-64	600.00
WR159	5.925-6.425	CPR159G	62845-59	670.00
WR187	4.4-5.0	UG-149A/U, UG-148C/U	62837-44	700.00
WR187	4.4-5.0	CPR187G	62846-44	700.00
WR229	3.7-4.2	CPR229G	62847-37	700.00

Rectangular Waveguide Hangers and Accessories — Page 207

	WR229	WR187	WR159	WR137	WR112
Rigid Hanger	19007-229 $ 32.00	19007-187 $ 26.50	19007-159 $ 26.50	19007-137 $ 26.50	19007-112 $ 26.50
Sliding Hanger	19008-229 32.00	19008-187 26.50	19008-159 26.50	19008-137 26.50	19008-112 26.50
Flex-Twist Hanger	66412-229 62.00	— —	66412-159 56.00	66412-137 54.00	— —
Wall/Roof Feed Thru	55040-229 230.00	55040-187 230.00	55040-159 230.00	55040-137 220.00	55040-112 220.00

Rectangular Waveguide Hangers and Accessories — Page 207

	WR90	WR75	WR62	WR42
Rigid Hanger	19007-90 $ 26.50	19007-75 $ 26.50	19007-62 $ 30.00	19007-42 $ 52.00
Sliding Hanger	19008-90 26.50	19008-75 26.50	19008-62 30.00	19008-42 52.00
Flex-Twist Hanger	66412-90 52.00	— —	— —	— —
Wall/Roof Feed Thru	55040-90 220.00	55040-75 220.00	55040-62 220.00	55040-42 220.00

Rectangular Waveguide — Other Accessories — Page 207

Type Number	Description	Price $ U.S.
49486	Current By-Pass Kit	11.75
31768A	Angle Adaptor Kit of 10	57.00

Threaded Rod Support Kit — Page 207

	Kit of 1 Type Number	Kit of 1 Price $ U.S.	Kit of 5 Type Number	Kit of 5 Price $ U.S.
12 in. (305 mm) Rod	31771	14.00	31771-4	70.00
24 in. (610 mm) Rod	31771-9	20.00	31771-6	100.00

HELIAX® Coaxial Cable —

Pages 210-261

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HELIAX Cable and Connectors —

Pages 222-239

Type Number	Description	Price $ U.S.
1/4″ Foam-Dielectric, 50 ohm — Pages 222, 223		
FHJ1-50	Standard Cable, Standard Jacket	1.04/ft.*
41690-22	Standard Cable, Fire Retardant Jacket	1.26/ft.*
41W	N Plug	33.80
41EW	N Plug, Low VSWR	60.40
41N	N Jack	33.80
41EN	N Jack, Low VSWR	62.40
41P	UHF Plug	33.80
41U	UHF Jack	39.50
41EWT	TNC Plug	66.00
41ENT	TNC Jack	68.00
41EWS	SMA Plug	68.00
41ENS	SMA Jack	68.00
13074A	End Terminal Adaptor	55.00
1/4″ Superflexible, 50 ohm — Pages 222, 223		
FSJ1-50	Standard Cable, Standard Jacket	1.20/ft.*
41690-21	Standard Cable, Fire Retardant Jacket	1.52/ft.*
41SW	N Plug	9.35
41SEW	N Plug, Low VSWR	49.00
41SP	UHF Plug	6.25
41SJ	HN Plug	77.00
41SWT	TNC Plug	32.80
40622	BNC Plug	7.80
41SWS	SMA Plug	60.00
41SNS	SMA Jack	60.00
1/4″ Superflexible, 75 ohm — Pages 222, 223		
FSJ1-75	Standard Cable, Standard Jacket	1.20/ft.*
41690-18	Standard Cable, Fire Retardant Jacket	1.52/ft.*
41SW-75†	N Plug, 50 ohm pin	17.50
41SW-70	N Plug, 70 ohm pin	37.00
41SN-70	N Jack, 70 ohm pin	37.00
41SP	UHF Plug, 50 ohm pin	6.25
41SWT-75	TNC Plug, 50 ohm pin	32.80
49651†	BNC Plug, 50 ohm pin	36.50
41SCM†	CATV Type "F"	20.00
3/8″ Foam-Dielectric, 50 ohm — Pages 224, 225		
LDF2-50	Standard Cable, Standard Jacket	1.38/ft.*
41690-43	Standard Cable, Fire Retardant Jacket	1.66/ft.*
L42W	N Plug	26.00
L42EW†	N Plug, Low VSWR	54.00
L42N	N Jack	26.00
L42EN†	N Jack, Low VSWR	54.00
L42P	UHF Plug	33.00
L42U	UHF Jack	33.00
L42WT	TNC Plug	52.00
L42EWT†	TNC Plug, Low VSWR	62.50
L42NT	TNC Jack	52.00
L42ENT†	TNC Jack, Low VSWR	62.50
120810-1	SMA Plug	52.00

Type Number	Description	Price $ U.S.
1/2″ Superflexible, 50 ohm — Pages 224, 225		
FSJ4-50B	Standard Cable, Standard Jacket	2.70/ft.*
41690-24	Standard Cable, Fire Retardant Jacket	3.16/ft.*
44ASR	⅞″ EIA Flange	98.00
44ASW	N Plug	27.00
44ASN	N Jack	27.00
44ASP	UHF Plug	27.00
44ASU	UHF Jack	27.00
44ASJ	HN Plug	77.00
49600	N Plug, Right Angle	56.00
44ASGR	GR Adaptor	120.00
1/2″ Superflexible, 75 ohm — Pages 224, 225		
FSJ4-75A	Standard Cable, Standard Jacket	2.70/ft.*
41690-44	Standard Cable, Fire Retardant Jacket	3.16/ft.*
44ASW-75	N Plug, 50 ohm pin	31.20
44ASN-75	N Jack, 50 ohm pin	31.20
44ASP-75	UHF Plug	31.20
44ASU-75	UHF Jack	31.20
49600-75	N Plug, Right Angle	62.00
44ASCM†	CATV Type F	30.00
1/2″ Foam-Dielectric, 50 ohm — Pages 226, 227		
LDF4-50A	Standard Cable, Standard Jacket	1.80/ft.*
41690-8	Standard Cable, Fire Retardant Jacket	2.16/ft.*
L44F	"F" Flange, Male	102.00
L44R	⅞″ EIA Flange	84.00
L44W	N Plug	23.70
L44EW	N Plug, Low VSWR	54.00
L44N	N Jack	23.70
L44EN	N Jack, Low VSWR	54.00
L44P	UHF Plug	20.80
L44U	UHF Jack	20.80
L44M	LC Plug	84.00
L44J	HN Plug	84.00
L44DM	7/16 DIN, Male	78.00
L44DF	7/16 DIN, Female	115.00
L44T	End Terminal	94.00
43716	N Plug, Right Angle	62.40
124990-1	⅞″ EIA Right Angle	145.00
L44Z	Splice	82.00
1/2″ Foam-Dielectric, 75 ohm — Pages 226, 227		
LDF4-75A	Standard Cable, Standard Jacket	1.80/ft.*
41690-17	Standard Cable, Fire Retardant Jacket	2.16/ft.*
L44W-75	N Plug, 50 ohm pin	27.00
L44W-70	N Plug, 70 ohm pin	33.00
L44N-75	N Jack, 50 ohm pin	27.00
L44N-70	N Jack, 70 ohm pin	33.00
L44P-75	UHF Plug	26.00
L44U-75	UHF Jack	26.00
206161	N Plug, Right Angle	83.00
48070	CATV Equipment Housing	18.00

Type Number	Description	Price $ U.S.
7/8″ Foam-Dielectric, 50 ohm — Pages 228, 229		
LDF5-50A	Standard Cable, Standard Jacket	4.70/ft.*
41690-9	Standard Cable, Fire Retardant Jacket	5.58/ft.*
L45F	"F" Flange, Male	105.00
L45R	⅞″ EIA Flange	88.00
124800-1	⅞″ EIA Flange, Right Angle	156.00
L45W	N Plug	58.00
L45N	N Jack	58.00
L45P	UHF Plug	55.00
L45U	UHF Jack	55.00
L45M	LC Plug	120.00
L45L	LC Jack	120.00
L45J	HN Plug	130.00
L45DM	7/16 DIN, Male	88.00
L45DF	7/16 DIN, Female	135.00
L45T	End Terminal	110.00
L45Z	Splice	98.00
7/8″ Foam-Dielectric, 75 ohm — Pages 228, 229		
FHJ5-75	Standard Cable, Standard Jacket	4.70/ft.*
41690-45	Standard Cable, Fire Retardant Jacket	5.58/ft.*
45AN-75	N Jack, 50 ohm pin	88.00
1/2″ High-Temperature Foam, 50 ohm New Products		
FT4-50	Unjacketed Cable	6.70/ft.*
FT4-50T	Jacketed Cable,	8.90/ft.*
L44F	"F" Flange	102.00
L44R	⅞″ EIA Flange	84.00
L44W	N Plug	23.70
L44EW	N Plug, Low VSWR	54.00
L44N	N Jack	23.70
L44EN	N Jack, Low VSWR	54.00
L44P	UHF Plug	20.80
L44U	UHF Jack	20.80
L44M	LC Plug	84.00
L44J	HN Plug	84.00
L44DM	7/16 DIN, Male	78.00
L44DF	7/16 DIN, Female	115.00
L44T	End Terminal	94.00
43716	N Plug, Right Angle	62.40
124990-1	⅞″ EIA Flange, Right Angle	145.00
L44Z	Splice	82.00
7/8″ High-Temperature Foam, 50 ohm New Products		
FT5-50	Unjacketed Cable	11.20/ft.*
FT5-50T	Jacketed Cable,	19.00/ft.*
L45F	"F" Flange, Male	105.00
L45R	⅞″ EIA Flange	88.00
L45W	N Plug	58.00
L45N	N Jack	58.00
L45P	UHF Plug	55.00
L45U	UHF Jack	55.00
L45M	LC Plug	120.00
L45L	LC Jack	120.00
L45J	HN Plug	130.00
L45DM	7/16 DIN, Male	88.00
L45DF	7/16 DIN, Female	135.00
L45T	End Terminal	110.00
124800-1	⅞″ EIA Flange, Right Angle	156.00
L45Z	Splice	98.00

*For cable assemblies 50 ft. or less, add $10.00 per connector attachment. †New Product.

HELIAX Cable and Connectors — Pages 222-239 *(continued)*

Type Number	Description	Price $ U.S.
1¼" Foam-Dielectric, 50 ohm — Pages 230, 231		
LDF6-50	Standard Cable, Standard Jacket	8.10/ft.**
41690-46	Standard Cable, Fire Retardant Jacket	9.62/ft.**
L46R	1⅝" EIA Flange	166.00
L46S	⅞" EIA Flange	166.00
L46F	"F" Flange, Male	160.00
L46W	N Plug	98.00
L46N	N Jack	98.00
L46M	LC Plug	182.00
L46L	LC Jack	182.00
L46DM	7/16 DIN, Male	150.00
L46DF	7/16 DIN, Female	192.00
L46Z	Splice	178.00
2061	1⅝" End Terminal	182.00
1261B	1⅝" Gas Barrier	186.00
1⅝" Foam-Dielectric, 50 ohm — Pages 230, 231		
LDF7-50A	Standard Cable, Standard Jacket	11.10/ft.**
41690-23	Standard Cable, Fire Retardant Jacket	13.10/ft.**
L47R	1⅝" EIA Flange	210.00
L47S	⅞" EIA Flange	250.00
L47F	"F" Flange, Male	225.00
201942	"F" Flange, Female	230.00
L47N	N Jack	185.00
L47M	LC Plug	235.00
L47L	LC Jack	235.00
L47DM	7/16 DIN, Male	240.00
L47DF	7/16 DIN, Female	260.00
L47Z	Splice	235.00
2061	1⅝" End Terminal	182.00
1261B	1⅝" Gas Barrier	186.00
1/2" Air-Dielectric, 50 ohm — Pages 232, 233		
HJ4-50	Standard Cable, Standard Jacket	3.02/ft.*
41690-49	Standard Cable, Fire Retardant Jacket	3.62/ft.*
74AW	N Plug	71.00
74AN	N Jack	71.00
74U	UHF Jack	On App.
74T	End Terminal	On App.
74Z	Splice	177.00
1/2" High Temperature Air, 50 ohm — Pages 232, 233		
HT4-50	Unjacketed Cable	6.20/ft.*
74AW	N Plug	71.00
74AN	N Jack	71.00
74U	UHF Jack	On App.
74T	End Terminal	On App.
74Z	Splice	177.00
1/2" Air-Dielectric, 75 ohm — New Products		
HJ4-75	Standard Cable, Standard Jacket	3.02/ft.*
41690-51	Standard Cable, Fire Retardant Jacket	3.62/ft.*
74AW-70	N Plug, 70 ohm pin	98.00

Type Number	Description	Price $ U.S.
7/8" High-Temperature Air, 50 ohm — Pages 232, 233		
HT5-50	Unjacketed Cable	11.40/ft.*
75AR	⅞" EIA Flange	97.00
75AG	⅞" EIA Flange, Gas Barrier	140.00
75AW	N Plug	73.00
75AN	N Jack	73.00
75AU	UHF Jack	77.00
75DM	7/16 DIN, Male	295.00
75AM	LC Plug	162.00
75AT	End Terminal	175.00
1060A	⅞" Mitre Elbow	130.00
75AZ	Splice	108.00
1260A	⅞" EIA Gas Barrier	135.00
7/8" Air-Dielectric, 50 ohm — Pages 234, 235		
HJ5-50	Standard Cable, Standard Jacket	5.58/ft.*
41690-10	Standard Cable, Fire Retardant Jacket	6.58/ft.*
75AR	⅞" EIA Flange	97.00
75AG	⅞" EIA Flange, Gas Barrier	140.00
75AW	N Plug	73.00
75AN	N Jack	73.00
75AU	UHF Jack	77.00
75DM	7/16 DIN, Male	295.00
75AM	LC Plug	162.00
75AT	End Terminal	175.00
1060A	⅞" Mitre Elbow	130.00
75AZ	Splice	108.00
1260A	⅞" EIA Gas Barrier	135.00
7/8" Air-Dielectric, 75 ohm — Pages 234, 235		
HJ5-75	Standard Cable, Standard Jacket	5.58/ft.*
41690-47	Standard Cable, Fire Retardant Jacket	6.58/ft.*
75AR-75	⅞" EIA Flange, 50 ohm pin	185.00
75AW-75	N Plug, 50 ohm pin	185.00
75AN-75	N Jack, 50 ohm pin	162.00
75AU-75	UHF Jack, 50 ohm pin	225.00
75AM-75	LC Plug, 50 ohm pin	230.00
75AT-75	End Terminal	240.00
75AZ-75	Splice	280.00
1⅝" Air-Dielectric, 50 ohm — Pages 236, 237		
HJ7-50A	Standard Cable, Standard Jacket	12.00/ft.**
41690-11	Standard Cable, Fire Retardant Jacket	14.15/ft.**
87R	1⅝" EIA Flange	192.00
87G	1⅝" EIA Flange, Gas Barrier	218.00
87N	N Jack	192.00
87L	LC Jack	275.00
87T	End Terminal	300.00
87Z	Splice	275.00
1261B	1⅝" EIA Gas Barrier	186.00
87S	⅞" EIA Flange	228.00
87SG	⅞" EIA Flange, Gas Barrier	260.00
2061	1⅝" EIA End Terminal	182.00
34660	1⅝" EIA Inner Connector	27.00

Type Number	Description	Price $ U.S.
1⅝" Air-Dielectric, 75 ohm — Pages 236, 237		
HJ7-75	Standard Cable, Standard Jacket	12.00/ft.**
41690-48	Standard Cable, Fire Retardant Jacket	14.15/ft.**
77AR-75	1⅝" EIA Flange, 50 ohm pin	On App.
77AN-75	N Jack, 50 ohm pin	On App.
77AZ-75	Splice	On App.
2¼" Air-Dielectric, 50 ohm — New Products		
HJ12-50	Standard Cable, Standard Jacket	17.00/ft.**
41690-52	Standard Cable, Fire Retardant Jacket	20.00/ft.**
82R	1⅝" EIA Flange	260.00
82N	N Jack	250.00
2061	1⅝" EIA End Terminal	182.00
34660	1⅝" EIA Inner Connector	27.00
82Z	Splice	340.00
3" Air-Dielectric, 50 ohm — Pages 238, 239		
HJ8-50B	Standard Cable, Standard Jacket	22.30/ft.**
78ARM	3⅛" EIA Flange, Male	345.00
78AGM	3⅛" EIA Flange, Male, Gas Barrier	365.00
78AGF	3⅛" EIA Flange, Female, Gas Barrier	355.00
78ARF	3⅛" EIA Flange, Female	335.00
2062	3⅛" EIA End Terminal	375.00
1062A	3⅛" Mitre Elbow	340.00
78BZ	Splice	430.00
78AS	1⅝" EIA Flange	435.00
15093A	3⅛" EIA Inner Connector	61.00
4" Air-Dielectric, 50 ohm — Pages 238, 239		
HJ11-50	Standard Cable, Standard Jacket	24.30/ft.**
81GF	3⅛" EIA Flange, Female, Gas Barrier	540.00
81RF	3⅛" EIA Flange, Female	530.00
2062	3⅛" EIA End Terminal	375.00
42896	6⅛" EIA Flange, Female	1,350.00
42826	6⅛" EIA Flange, Female, Gas Barrier	1,370.00
1062A	3⅛" EIA Flange	340.00
81Z	Splice	620.00
1861	Reducer 3⅛" to 1⅝"	220.00
18902	6⅛" EIA Inner Connector	290.00
15093A	3⅛" EIA Inner Connector	61.00
5" Air-Dielectric, 50 ohm — Pages 238, 239		
HJ9-50	Standard Cable, Standard Jacket	35.30/ft.**
79AR	6⅛" EIA Flange, Male	1,030.00
79AG	6⅛" EIA Flange, Male, Gas Barrier	1,080.00
1073	6⅛" Mitre Elbow	1,200.00
79AZ	Splice	1,130.00
1872	Reducer 6⅛" to 3⅛"	1,120.00

*For cable assemblies 50 ft. or less, add $10.00 per connector attachment. **For cable assemblies 50 ft. or less, add $20.00 per connector attachment.

HELIAX Foam-Dielectric Microwave Cables — Pages 240, 241

Type Number	Description	Price $ U.S.
1/2″ Foam-Dielectric		
LDF4P-50A	Low VSWR Coaxial Cable	2.10/ft.*
L44EW	N Plug	54.00
L44EN	N Jack	54.00
L44F	"F" Flange, Male	102.00
L44R	⅞″ EIA Flange	84.00
7/8″ Foam-Dielectric		
LDF5P-50A	Low VSWR Coaxial Cable	5.48/ft.*
L45W	N Plug	58.00
L45N	N Jack	58.00
L45F	"F" Flange, Male	105.00
48041	"F" Flange, Female	188.00
L45R	⅞″ EIA Flange	88.00
1¼″ Foam-Dielectric		
LDF6P-50	Low VSWR Coaxial Cable	9.15/ft.**
L46W	N Plug	98.00
L46N	N Jack	98.00
L46F	"F" Flange, Male	160.00
L46S	⅞″ EIA Flange	166.00
1⅝″ Foam-Dielectric		
LDF7P-50A	Low VSWR Coaxial Cable	12.30/ft.**
L47N	N Jack	185.00
L47F	"F" Flange, Male	225.00
201942	"F" Flange, Female	230.00
L47S	⅞″ EIA Flange	250.00
Components		
104300-2	"F" Flange Female/N Jack Adaptor	220.00
203361	Elbow, "F" Flange	220.00

Low VSWR Jumpers — Page 240

Type Number	Frequency MHz	Length feet (m)	Price $ U.S.
Type N Plug/Type N Plug Connectors			
44202-3	1427-1535	3 (0.9)	122.00
44202-6	1427-1535	6 (1.8)	128.00
41656B-3	1700-2300	3 (0.9)	122.00
41656B-6	1700-2300	6 (1.8)	128.00
42128B-3	1700-2300	3 (0.9)	144.00
42128B-6	1700-2300	6 (1.8)	150.00
48695-3	2300-2700	3 (0.9)	122.00
48695-6	2300-2700	6 (1.8)	128.00

Low VSWR Jumpers — Page 240 *(continued)*

Type Number	Frequency MHz	Length feet (m)	Price $ U.S.
7/8″ EIA Flange/N Plug Connectors			
200834-3	1700-2300	3 (0.9)	157.00
200834-6	1700-2300	6 (1.8)	163.00
"F" Flange Male/"F" Flange Male Connectors			
202376-3	1700-2300	3 (0.9)	230.00
202376-6	1700-2300	6 (1.8)	236.00

HELIAX Air-Dielectric Microwave Cables — Pages 242, 243

Type Number	Description	Price $ U.S.
⅞″ Air-Dielectric		
HJ5P-50	Low VSWR Coaxial Cable	6.42/ft.*
75AR	⅞″ EIA Flange	97.00
75AG	⅞″ EIA Flange, Gas Barrier	140.00
75ART	Tunable ⅞″ EIA	286.00
75AGT	Tunable ⅞″ EIA, Gas Barrier	325.00
75WT	Tunable N Plug	250.00
75NT	Tunable N Jack	250.00
1⅝″ Air-Dielectric		
HJ7SP-50A	Low VSWR Coaxial Cable	14.35/ft.**
HJ7P-50A	Low VSWR Coaxial Cable	13.85/ft.
87S	⅞″ EIA Flange	228.00
87SG	⅞″ EIA Flange, Gas Barrier	260.00
87ST	Tunable ⅞″ EIA	440.00
87SGT	Tunable ⅞″ EIA, Gas Barrier	490.00
87WT	Tunable N Plug	460.00
87NT	Tunable N Jack	380.00
Components		
33682	⅞″ EIA/"F" Flange, Male Adaptor	120.00
104300-2	"F" Flange, Female/N Jack Adaptor	220.00

*For cable assemblies 50 ft. or less, add $10.00 per connector attachment.
**For cable assemblies 50 ft. or less, add $20.00 per connector attachment.

HELIAX Low VSWR Cable Assemblies for ESA Applications — Page 244

Frequency	Connectors	Assemblies Type Number	Assemblies Price $ U.S.	Bulk Cable Type Number	Bulk Cable Price $ U.S.
1/4″, 50 ohm, Superflexible					
5.85-6.425 GHz	N Plug/N Plug	201083A	145.00 +1.38/ft.	48659-7	1.38/ft.
10.95-12.2 GHz	N Plug/N Plug	201084A	145.00 +1.38/ft.	48659-10	1.38/ft.
	SMA Plug/SMA Plug	207038	145.00 +1.38/ft.		
12.2-12.75 GHz	N Plug/N Plug	201085	145.00 +1.38/ft.	48659-11	1.38/ft.
	SMA Plug/SMA Plug	207039	145.00 +1.38/ft.		
14.0-14.5 GHz	N Plug/N Plug	201085	145.00 +1.38/ft.	48659-11	1.38/ft.
	SMA Plug/SMA Plug	207040	145.00 +1.38/ft.		
3/8″, 50 ohm, Foam-Dielectric					
5.85-6.425 GHz	N Plug/N Plug	201074A	156.00 +1.60/ft.	49774-2	1.60/ft.
	N Plug/N Jack	201075A	156.00 +1.60/ft.		
10.95-12.75 GHz	N Plug/N Plug	201078A	156.00 +1.60/ft.	49774-3	1.60/ft.
	N Plug/N Jack	201079A	156.00 +1.60/ft.		

Prices by Product Category

HELIAX Low VSWR Cable Assemblies for ESA Applications — Page 244 *(continued)*

Frequency	Connectors	Assemblies Type Number	Assemblies Price $ U.S.	Bulk Cable Type Number	Bulk Cable Price $ U.S.
1/2″, 50 ohm, Foam-Dielectric					
0.94-1.45 GHz	N Plug/N Plug	43004A	156.00 +2.10/ft.	43818-42	2.10/ft.
	N Plug/N Jack	43005A	156.00 +2.10/ft.		
3.625-4.2 GHz	N Plug/N Plug	42125B	156.00 +2.10/ft.	43818-5	2.10/ft.
	N Plug/N Jack	42167B	156.00 +2.10/ft.		
5.85-6.425 GHz	N Plug/N Plug	42126B	156.00 +2.10/ft.	43818-6	2.10/ft.
	N Plug/N Jack	42168B	156.00 +2.10/ft.		
1/2″, 50 ohm, Superflexible					
0.94-1.45 GHz	N Plug/N Plug	48363A	125.00 +3.08/ft.	47869A-1	3.08/ft.
	N Plug/N Jack	48364A	125.00 +3.08/ft.		
3.625-4.2 GHz	N Plug/N Plug	48367A	125.00 +3.08/ft.	47869A-11	3.08/ft.
	N Plug/N Jack	48368A	125.00 +3.08/ft.		
5.85-6.425 GHz	N Plug/N Plug	48369A	125.00 +3.08/ft.	47869A-12	3.08/ft.
	N Plug/N Jack	48370A	125.00 +3.08/ft.		
7/8″, 50 ohm, Foam-Dielectric					
3.625-4.2 GHz	N Plug/N Plug	207043	156.00 +5.48/ft.	42150B-39	5.48/ft.
	N Plug/N Jack	207044	156.00 +5.48/ft.		
1/2″, 50 ohm, Air-Dielectric					
0.94-1.45 GHz	N Plug/N Plug	207045	198.00 +3.48/ft.	207032-1	3.52/ft.
	N Plug/N Jack	207046	198.00 +3.48/ft.		
3.625-4.2 GHz	N Plug/N Plug	207047	198.00 +3.48/ft.	207032-2	3.52/ft.
	N Plug/N Jack	207048	198.00 +3.48/ft.		
7/8″, 50 ohm, Air-Dielectric					
3.625-4.2 GHz	N Plug/N Plug	207051	198.00 +6.42/ft.	25831-2	6.80/ft.
	N Plug/N Jack	207052	198.00 +6.42/ft.		
1/4″, 75 ohm, Superflexible					
52-88 MHz	N Plug/N Plug	207053	145.00 +1.38/ft.	207033-1	1.38/ft.
	N Plug/N Jack	207054	145.00 +1.38/ft.		
104-176 MHz	N Plug/N Plug	207057	145.00 +1.38/ft.	207033-2	1.38/ft.
	N Plug/N Jack	207058	145.00 +1.38/ft.		

Broadcast Cables — Page 245

Type Number	Size	Price $ U.S.
LDF5-50A	⅞″ Foam	4.70/ft.
LDF6-50	1¼″ Foam	8.10/ft.
LDF7-50A	1⅝″ Foam	11.10/ft.
HJ5-50	⅞″ Air	5.58/ft.
HJ7-50A	1⅝″ Air	12.00/ft.
42140	1⅝″ Air, Low VSWR	170.00 +13.40/ft.
HJ12-50	2¼″ Air	17.00/ft.
207761	2¼″ Air, Low VSWR	175.00 +19.00/ft.
HJ8-50B	3″ Air	22.30/ft.
42141	3″ Air, Low VSWR	175.00 +25.00/ft.
HJ11-50	4″ Air	24.30/ft.
42144	4″ Air, Low VSWR	175.00 +27.00/ft.
HJ9-50	5″ Air	35.30/ft.
42142	5″ Air, Low VSWR	175.00 +39.20/ft.

Cellular Radio Cables, 824-894 MHz — Page 247

Type Number	Size	Price $ U.S.
43818-41	½″ Foam	1.80/ft.
42150B-48	⅞″ Foam	4.70/ft.
205360	1¼″ Foam	8.10/ft.
42151A-18	1⅝″ Foam	11.10/ft.
25831-3	⅞″ Air	5.58/ft.
25816A-31	1⅝″ Air	12.00/ft.
207760	2¼″ Air	17.00/ft.

Phase-Stabilized and Radio Sampling Lines — Page 246

	1/4″ Foam Type Number	1/4″ Foam Price $ U.S.	3/8″ Foam Type Number	3/8″ Foam Price $ U.S.	1/2″ Foam Type Number	1/2″ Foam Price $ U.S.
Type Number, Phase Stabilized	35422-11	1.20/ft.	35422-22	1.60/ft.	35422-14	2.08/ft.
Type Number, Phase Stabilized and Cut to Equal Electrical Length	42394-11	50.00 +1.20/ft.	42394-22	50.00 +1.20/ft.	42394-14	50.00 +2.08/ft.
UHF Jack	41U	39.50	L42U	33.00	L44U	20.80
UHF Plug	41P	33.80	L42P	33.00	L44P	20.80
N Jack	41N	33.80	L42N	26.00	L44N	23.70
N Plug	41W	33.80	L42W	26.00	L44W	23.70
End Terminal	13074A	55.00	13074A	55.00	L44T	94.00

Cellular Radio Jumper Cables, 824-894 MHz — Page 247

Cable Type	Connectors	Length ft.	Type Number	Price $ U.S.
For Antenna Connection				
½″ LDF Foam	N Plug/N Plug	3	39816-100	70.00
½″ LDF Foam	N Plug/N Plug	6	39816-96	75.00
½″ LDF Foam	N Plug/N Plug	10	39816-97	83.00
½″ Superflexible	N Plug/N Plug	3	39818A-240	74.00
½″ Superflexible	N Plug/N Plug	6	39818A-241	82.00
½″ Superflexible	N Plug/N Plug	10	39818A-208	98.00
⅞″ Air-Dielectric	⅞″ EIA, 50 ohm / ⅞″ EIA, 50 ohm	7.33	48148	280.00
For Equipment Room Connection				
½″ LDF Foam	N Plug/N Plug	15	39816-104	93.00
½″ LDF Foam	N Plug/N Plug	20	39816-105	102.00
½″ LDF Foam	N Plug/N Plug	25	39816-106	111.00
½″ LDF Foam	N Plug/N Plug	30	39816-107	120.00
½″ Superflexible	N Plug/N Plug	15	39818A-209	112.00
½″ Superflexible	N Plug/N Plug	20	39818A-210	125.00
½″ Superflexible	N Plug/N Plug	25	39818A-211	138.00
½″ Superflexible	N Plug/N Plug	30	39818A-212	152.00

Standard HELIAX® Jumper Cable Assemblies, 50 ohm — Page 248

Connectors	Length ft. (m)	Type Number	Price $ U.S.
1/4″ Superflexible Cable Assemblies			
N Plug/N Plug	8 (2.4)	48100	44.00
UHF Plug/UHF Plug	8 (2.4)	48822	40.00
1/2″ Superflexible Cable Assemblies			
N Plug/N Plug	8 (2.4)	49768A	92.00
N Plug/N Plug	6 (1.8)	201122	87.00
N Plug/N Plug	3 (0.9)	201124	79.00
N Plug/N Jack	8 (2.4)	49769A	92.00
N Plug/UHF Plug	8 (2.4)	49770A	92.00
1/2″ LDF Foam Cable Assemblies			
N Plug/N Plug	6 (1.8)	43557-2	75.00
N Plug/N Plug	3 (0.9)	201123	70.00
N Plug/UHF Plug	6 (1.8)	43554-2	72.00
N Jack/UHF Plug	6 (1.8)	43660-2	72.00
UHF Plug/UHF Plug	6 (1.8)	43552-2	70.00

Low-VSWR HELIAX Jumper Cable Assemblies, 50 ohm — Pages 248, 249

Frequency GHz	Connectors	Type Number	Price $ U.S.
1/2″ HELIAX LDF Foam Cable Assemblies			
0.3-1.7	N Plug/N Plug	43004A	156.00 +2.10/ft.
	N Plug/N Jack	43005A	156.00 +2.10/ft.
1.7-2.3	N Plug/N Plug	41656B	156.00 +2.10/ft.
	N Plug/N Jack	42166B	156.00 +2.10/ft.
2.3-4.2	N Plug/N Plug	42125B	156.00 +2.10/ft.
	N Plug/N Jack	42167B	156.00 +2.10/ft.
3.7-8.0	N Plug/N Plug	42126B	156.00 +2.10/ft.
	N Plug/N Jack	42168B	156.00 +2.10/ft.
1/2″ HELIAX Superflexible Cable Assemblies			
0.3-1.7	Type N Plug/Type N Plug	48363A	125.00 +3.08/ft.
	Type N Plug/Type N Jack	48364A	125.00 +3.08/ft.
1.7-2.3	Type N Plug/Type N Plug	48365A	125.00 +3.08/ft.
	Type N Plug/Type N Jack	48366A	125.00 +3.08/ft.
2.3-4.2	Type N Plug/Type N Plug	48367A	125.00 +3.08/ft.
	Type N Plug/Type N Jack	48368A	125.00 +3.08/ft.
4.2-7.1	Type N Plug/Type N Plug	48369A	125.00 +3.08/ft.
	Type N Plug/Type N Jack	48370A	125.00 +3.08/ft.
3/8″ HELIAX LDF Foam Cable Assemblies			
1.7-2.3	Type N Plug/Type N Plug	201066	156.00 +1.60/ft.
	Type N Plug/Type N Jack	201067	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Plug	201068	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Jack	201069	156.00 +1.60/ft.
3.4-4.2	Type N Plug/Type N Plug	201070	156.00 +1.60/ft.
	Type N Plug/Type N Jack	201071	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Plug	201072	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Jack	201073	156.00 +1.60/ft.
4.2-8.5	Type N Plug/Type N Plug	201074A	156.00 +1.60/ft.
	Type N Plug/Type N Jack	201075A	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Plug	201076A	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Jack	201077A	156.00 +1.60/ft.
8.0-12.75	Type N Plug/Type N Plug	201078A	156.00 +1.60/ft.
	Type N Plug/Type N Jack	201079A	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Plug	201080A	156.00 +1.60/ft.
	Type TNC Plug/Type TNC Jack	201081A	156.00 +1.60/ft.

Low VSWR HELIAX Jumper Cable Assemblies, 50 ohm — Pages 248, 249 *(continued)*

Frequency GHz	Connectors	Type Number	Price $ U.S.
1/4″ HELIAX Foam Cable Assemblies			
0.3-4.2	Type N Plug/Type N Plug	42169B	156.00 +1.20/ft.
	Type N Plug/Type N Jack	42172B	156.00 +1.20/ft.
	Type N Plug/Type TNC Plug	42175B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Plug	42178B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Jack	42182B	156.00 +1.20/ft.
4.0-8.5	Type N Plug/Type N Plug	42170B	156.00 +1.20/ft.
	Type N Plug/Type N Jack	42173B	156.00 +1.20/ft.
	Type N Plug/Type TNC Plug	42176B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Plug	42179B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Jack	42183B	156.00 +1.20/ft.
8.0-12.75	Type N Plug/Type N Plug	42171B	156.00 +1.20/ft.
	Type N Plug/Type N Jack	42174B	156.00 +1.20/ft.
	Type N Plug/Type TNC Plug	42188B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Plug	42180B	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Jack	42184B	156.00 +1.20/ft.
12.0-16.0	Type TNC Plug/Type TNC Plug	42579A	156.00 +1.20/ft.
	Type TNC Plug/Type TNC Jack	42580A	156.00 +1.20/ft.
10.95-18.0	Type SMA Plug/Type SMA Plug	42962A	156.00 +1.20/ft.
	Type SMA Plug/Type SMA Jack	42963A	156.00 +1.20/ft.
1/4″ HELIAX Superflexible Cable Assemblies			
0.3-4.2	Type N Plug/Type N Plug	201082A	145.00 +1.38/ft.
4.0-8.5	Type N Plug/Type N Plug	201083A	145.00 +1.38/ft.
8.0-12.2	Type N Plug/Type N Plug	201084A	145.00 +1.38/ft.
12.0-18.0	Type N Plug/Type N Plug	201085	145.00 +1.38/ft.

RF Connector Adaptors — Page 251

Description	Type Number	Price $ U.S.
N Junction, Female Both Ends	10804-11	11.50
N Junction, Male Both Ends	10804-9	15.60
N Right Angle, Male-Female	10804-66	17.70
N Tee, Female-Female-Female	10804-17	23.00
UHF Junction, Female Both Ends	10805-6	11.00
UHF Right Angle, Male-Female	10805-5	18.20
UHF Tee, Female-Male-Female	10805-4	21.80
N Jack, UHF Plug	10805-12	17.50
N Plug, UHF Jack Adaptor	10805-11	17.00
"F" Flange (Male), ⅞" EIA, Flange Adaptor	33682	120.00
"F" Flange (Female), Type N Jack Adaptor	104300-2	220.00
"F" Flange Elbow, "F" Flange (Male), "F" Flange (Female)	203361	220.00

HELIAX® Coaxial Cable Accessories — Pages 252-256

	1/2"	7/8"	1¼"	1⅝"	2¼"	3"	4"	5"
Hanger Kit of 10	43211 $29.00	42396A-5 $38.00	42396A-1 $38.00	42396A-2 $38.00	42396A-4 $38.00	31766A-11 $ 56.00	31766A-10 $ 62.00	33598-5 $ 85.00
Hanger, Snap In, Kit of 10	206706-1 34.00	206706-2 43.00	206706-3 43.00	206706-4 43.00	— —	— —	— —	— —
Hanger, Insulated	11662-3 19.20	11662-2 19.20	33948-5 28.00	33948-3 32.00	33948-6 40.00	33948-2 52.00	33948-4 62.00	33948-1 80.00
Grounding Kit	204989-1 19.00	204989-2 24.00	204989-3 25.00	204989-4 25.00	204989-5 26.00	204989-5 26.00	204989-6 37.00	204989-7 40.00
Hoisting Grip	43094 27.00	19256B 38.50	24312A 47.50	24312A 47.50	31535 53.00	26985A 73.00	34759 75.00	31031-1 140.00
Wall/Roof Feed Thru	40656-3 45.80	40656-1 46.80	40656-5 57.20	40656-2 66.50	40656-6 84.00	40394-2 120.00	40394-1 108.00	33938-5 140.00

Hardware and Angle Adaptor Kits of 10 — Pages 253-255

Type Number	Description	Price $ U.S.
31769-5	Hardware Kit, ⅜" × ¾" Long	12.00
31769-1	Hardware Kit, ⅜" × 1" Long	12.50
31769-4	Hardware Kit, ½" × 1¼" Long	32.00
31768A	Angle Adaptor, ½" to 4" Cables	57.00
33981A-1	Angle Adaptor, 5" Cable	83.00

Threaded Rod Support Kit — Page 253

Rod Length, in. (mm)	Kit of 1 Type Number	Kit of 1 Price $ U.S.	Kit of 5 Type Number	Kit of 5 Price $ U.S.
For 1/2" to 4" Cables				
12 (305)	31771	14.00	31771-4	70.00
24 (610)	31771-9	20.00	31771-6	100.00
For 5" Cables				
12 (305)	—	—	31771-5	104.00

Round Member Adaptor — Page 253

Member Diameter, in. (mm)	Type Number	Price $ U.S.
1-2 (25-50)	31670-1	20.80
2-3 (50-75)	31670-2	23.00
3-4 (75-100)	31670-3	26.50
4-5 (100-125)	31670-4	27.00
5-6 (125-150)	31670-5	27.50

Tower Standoff Kit of 10 — Page 253

Member Diameter in. (mm)	1 in. (25 mm) Standoff for ½" to 4" Type Number	Price $ U.S.	2.5 in. (60 mm) Standoff for ½" to 4" Type Number	Price $ U.S.	2.5 in. (60 mm) Standoff for 5" Type Number	Price $ U.S.
0.75-1.5 (20-40)	30848-5	98.00	—	—	—	—
1.5-3.0 (40-75)	30848-4	100.00	—	—	—	—
3-4 (75-100)	30848-1	125.00	41108A-1	140.00	43130-1	150.00
4-5 (100-125)	30848-2	125.00	41108A-2	140.00	43130-2	150.00
5-6 (125-150)	30848-3	128.00	41108A-3	145.00	43130-3	150.00

Adaptors for Insulated Hangers — Page 255

Type Number	Description	Price $ U.S.
40430-1	Angle For ½" and ⅞" Cable	10.50
13555A	Angle For 1⅝"-5" Cable	18.00
13550	Round, For 1⅝"-5" Cables	17.00
12395-1	Wraplock	43.00

Adaptors for Snap-In Hangers — New Products

Type Number	Description	Price $ U.S.
206929-1	Tower/Hanger Adaptor, 1 run	On App.
206929-4	Tower/Hanger Adaptor, 4 runs	On App.
206929-8	Tower/Hanger Adaptor, 8 runs	On App.
206930	J-Bolt Hardware Kit of 10	On App.
207030	Cluster Mount	On App.

Cable Boots — Page 256

Cable Size	4 in. (102 mm) Dia. Type Number	Price $ U.S.	5 in. (127 mm) Dia. Type Number	Price $ U.S.
½" Foam	204679-5†	65.00	48939-6†	65.00
½" Foam*	204679-7†	65.00	48939-8†	65.00
½" Air	204679-6†	65.00	48939-7†	65.00
½" Air*	204679-1	65.00	48939-5	65.00
⅞"	204679-2	65.00	48939-1	65.00
⅞"*	—	—	48939-2	85.00
1¼"	204679-3	65.00	48939-3	65.00
1⅝"	204679-4	65.00	48939-4	65.00
2¼"	—	—	—	—
3"	—	—	—	—
4"	—	—	—	—
5"	—	—	—	—

*3-holes †New Product

Prices by Product Category

Connector Reattachment Kit — Page 255

Type Number	For Connectors	Price $ U.S.
34767A-38	L42 Series	5.90
34767A-27	L44 Series	7.40
34767A-39	44AS Series	8.00
34767A-28	L45 Series	8.00
34767A-43	L46 Series	11.40
34767A-35	L47 Series	15.00
34767A-22	74AN, 74AW	8.30
34767A-3	75AN, 75AR, 75AW	8.30
34767A-5	75AG, 75AU	8.80
34767A-44	75ART, 75AGT	22.00
34767A-18	75NT	11.50
34767A-6	87G, 87R	10.90
34767A-7	87N, 87S, 87SG	10.90
34767A-20	87SGT, 87ST	11.00
34767A-19	87NT, 87WT	13.50
34767A-13	87Z	13.50
34767A-46	82N	15.00
34767A-47	82R	15.00
34767A-10	78AGF, 78AGM, 78ARF, 78ARM, 78AS	21.00
34767A-30	78BZ	22.00
34767A-15	81RF	31.20
34767A-16	81GF	31.20
34767A-17	81Z	31.20
34767A-8	79G, 79R	62.00
34767A-31	79AZ	64.00

Other Accessories — Page 255

Type Number	Description	Price $ U.S.
40417	Nylon Cable Tie Kit	31.20
34283	Connector Burial Kit	44.00
26016-2	Bulkhead Adaptor	7.20

Multiple Entrance Wall/Roof Feed-Thru Plate — Page 256

Number of Openings	Type Number	Price $ U.S.
4 in. (102 mm) Diameter Entry Opening		
1	204673-1	41.50
1	204673-2	41.50
4	204673-4	155.00
8	204673-8	245.00
5 in. (127 mm) Diameter Entry Opening		
1	48940-1	46.00
2	48940-2	108.00
3	48940-3	135.00
4	48940-4	168.00
6	48940-6	228.00

RADIAX® Slotted Coaxial Cable — Page 259

Type Number	Diameter	Price $ U.S.
RX4-1	½″	2.52/ft.
RX4-1R	½″	2.90/ft.
RX4-2A	½″	3.20/ft.
RX4-2R	½″	3.65/ft.
RX4-3A	½″	3.20/ft.
RX4-3R	½″	3.65/ft.
RX5-1	⅞″	5.45/ft.
RX5-1R	⅞″	6.25/ft.

Connectors — Page 261

Type Number	Interface	Price $ U.S.
44AW	N Plug	27.00
45AW	N Plug	68.00
44AN	N Jack	27.00
45AN	N Jack	68.00
44AP	UHF Plug	25.00
45AP	UHF Plug	64.00
44AU	UHF Jack	25.00
45AU	UHF Jack	64.00

Hangers, Kits of 10 — Page 261

Type Number	Description	Price $ U.S.
40954	Plated Steel, ½″	10.80
40785-1	Plated Steel, ⅞″	14.90
40954-2	Stainless Steel, ½″	21.20
40785-2	Stainless Steel, ⅞″	26.00
36720	Insulated Messenger Cable	10.90
36719	Insulated	15.00
43042	Standoff	36.50

Terminations — Page 261

Type Number	Description	Price $ U.S.
42419	Whip Antenna	48.00
32299-6	Load, 25 Watt, N Plug	90.00
32299-5	Load, 10 Watt, N Jack	190.00
42416	Load, 2 Watt, UHF Plug	54.00

Power Splitters — Page 261

	2-Way		3-Way		4-Way			
Frequency	Type Number	Price $ U.S.	Type Number	Price $ U.S.	Type Number	Price $ U.S.	Input Type	Output Type
30 MHz	42155	450.00	42156	560.00	42157	680.00	UHF Jack	UHF Jack
150 MHz	42192	140.00	42193A	370.00	42194	390.00	UHF Plug	UHF Jack
450 MHz	42152	230.00	42153	440.00	42154	540.00	N Plug	N Jack
900 MHz	44612	190.00	44613	420.00	44614	490.00	N Plug	N Jack

Broadcast Transmission Lines — Pages 262-273

F.O.B. Orland Park, Illinois

Rigid Line Components — Pages 263-269

	7/8″ 50 ohm	1-5/8″ 50 ohm	3-1/8″ 50 ohm	4-1/16″ 50 ohm	6-1/8″ 50 ohm	6-1/8″ 75 ohm
Premium Straight Sections With Bellows						
20 ft. Flanged Both Ends	—	—	ACX350-1	ACX450-1	ACX650-1	ACX675-1
	—	—	$ 610.00	$ 925.00	$1,575.00	$1,425.00
20 ft. Flanged One End	—	—	ACX350-4	ACX450-4	ACX650-4	ACX675-4
	—	—	500.00	1,050.00	1,450.00	1,450.00

Prices by Product Category

Rigid Line Components — Pages 263-269 *(continued)*

	7/8" 50 ohm	1-5/8" 50 ohm	3-1/8" 50 ohm	4-1/16" 50 ohm	6-1/8" 50 ohm	6-1/8" 75 ohm
Premium Straight Sections With Bellows *(continued)*						
20 ft. Unflanged	—	—	ACX350-5	ACX450-5	ACX650-5	ACX675-5
	—	—	$ 450.00	$ 950.00	$1,300.00	$1,200.00
19.75 ft. Flanged Both Ends	—	—	ACX350-2	ACX450-2	ACX650-2	ACX675-2
	—	—	610.00	925.00	1,575.00	1,425.00
19.5 ft. Flanged Both Ends	—	—	ACX350-3	ACX450-3	ACX650-3	ACX675-3
	—	—	610.00	925.00	1,575.00	1,425.00
Premium Straight Section						
20 ft. Flanged Both Ends	—	—	ACX350-31	ACX450-31	ACX650-31	ACX675-31
	—	—	585.00	890.00	1,475.00	1,325.00
20 ft. Flanged One End	—	—	ACX350-34	ACX450-34	ACX650-34	ACX675-34
	—	—	535.00	835.00	1,375.00	1,225.00
20 ft. Unflanged	—	—	ACX350-35	ACX450-35	ACX650-35	ACX675-35
	—	—	485.00	780.00	1,275.00	1,125.00
19.75 ft. Flanged Both Ends	—	—	ACX350-32	ACX450-32	ACX650-32	ACX675-32
	—	—	585.00	890.00	1,475.00	1,325.00
19.5 ft. Flanged Both Ends	—	—	ACX350-33	ACX450-33	ACX650-33	ACX675-33
	—	—	585.00	890.00	1,475.00	1,325.00
Standard Straight Section						
20 ft. Flanged Both Ends	—	561	562A	—	—	—
	—	$400.00	$680.00	—	—	—
20 ft. Flanged One End	—	561-11	562A-11	—	—	—
	—	385.00	660.00	—	—	—
20 ft. Unflanged	—	561-21	562A-21	—	—	—
	—	365.00	610.00	—	—	—
Flanged Both Ends	—	2761-1	2762A-1	—	—	—
	—	200.00 +12.50/ft.	280.00 +22.50/ft.	—	—	—
Flanged One End	—	2761-11	2762A-11	—	—	—
	—	190.00 +12.50/ft.	260.00 +22.50/ft.	—	—	—
Unflanged	—	2761-21	2762A-21	—	—	—
	—	158.00 +12.50/ft.	230.00 +22.50/ft.	—	—	—
Other Components						
90° Miter Elbow	1060A	1061A	1062A	ACX450-10	ACX650-10	ACX675-10
	130.00	190.00	340.00	600.00	1,000.00	1,000.00
90° Miter Elbow, Unflanged	—	1061A-3	1062A-3	—	—	—
	—	94.00	180.00	—	—	—
45° Miter Elbow	—	—	1162	—	—	—
	—	—	370.00	—	—	—
Flexible Section	—	20695	19209B	—	—	—
	—	620.00	1,030.00	—	—	—
Gas Barrier	1260A	1261B	1262B	ACX450-16	ACX650-16	ACX675-16
	135.00	186.00	340.00	550.00	1,200.00	1,000.00
N Female Adaptor	2260B	2261A	2262	—	—	—
	98.00	155.00	325.00	—	—	—
LC Female Adaptor	2360A	2361A	—	—	—	—
	158.00	195.00	—	—	—	—
Male-to-Male Adaptor	—	30452	23187	—	—	—
	—	108.00	142.00	—	—	—
End Terminal	—	2061	2062	—	—	—
	—	182.00	375.00	—	—	—
Inner Connector, Standard	34389A	34660	15093A	—	—	—
	13.60	27.00	61.00	—	—	—
Inner Connector, Premium	—	—	ACX350-20	ACX450-20	ACX650-20	ACX675-20
	—	—	60.00	100.00	200.00	160.00
Adaptor Inner Connector	4850A	4851	4852	—	—	—
	62.00	58.00	62.00	—	—	—
Unpressurized Coupling	—	4861A	4862A	—	—	—
	—	51.00	92.00	—	—	—
Soft Solder Swivel Flange	1560A	1561A	ACX350-37	ACX450-37	ACX675-37	ACX675-37
	44.00	68.00	125.00	190.00	270.00	270.00

Rigid Line Components — Pages 263-269 (continued)

	7/8" 50 ohm	1-5/8" 50 ohm	3-1/8" 50 ohm	4-1/16" 50 ohm	6-1/8" 50 ohm	6-1/8" 75 ohm
Other Components *(continued)*						
Swivel Flange Kit	18096 28.00	18041 37.00	18200 60.00	ACX450-27 95.00	ACX675-27 125.00	ACX675-27 125.00
Fixed Flange Kit	18630 22.00	18631 27.00	15840 40.00	ACX450-28 85.00	ACX675-28 80.00	ACX675-28 80.00
Hardware Kit	66748-6 6.00	69225-2 11.00	69226-2 13.00	ACX450-21 14.00	ACX675-21 20.00	ACX675-21 20.00
O-Ring Gasket	10683-197 2.10	10683-406 3.00	10683-405 4.00	10683-551 6.00	10683-10 4.00	10683-10 4.00
Hangers						
Rigid Hanger	— —	13924 42.00	13927 54.00	ACX450-13 80.00	ACX675-13 120.00	ACX675-13 120.00
Spring Hanger	— —	14379 50.00	13925 80.00	— —	— —	— —
Vertical Spring Hanger	— —	— —	ACX350-11 70.00	ACX450-11 85.00	ACX675-11 185.00	ACX675-11 185.00
Sliding Hanger	— —	14378 32.00	— —	— —	— —	— —
Horizontal Hanger	—	3911 62.00	3912 76.00	— —	— —	— —
Horizontal Anchor	— —	3901 160.00	3902 170.00	— —	— —	— —
Lateral Brace, Standard Line	— —	3921 94.00	3922 96.00	— —	— —	— —
Lateral Brace, Premium Line	— —	— —	ACX350-14 50.00	ACX450-14 50.00	ACX675-14 75.00	ACX675-14 75.00
3 Point Suspension Hanger	— —	— —	ACX350-12 110.00	ACX450-12 150.00	ACX675-12 210.00	ACX675-12 210.00
Wall/Roof Feed Thru	— —	— —	ACX350-15 90.00	ACX450-15 150.00	ACX675-15 275.00	ACX675-15 275.00

Prices by Product Category

6⅛" Impedance Transformer — Page 266

Type	Channel Number	Price $ U.S.
ACX675-17-2	2	1,900.00
ACX675-17-3	3	1,900.00
ACX675-17-4	4	1,900.00
ACX675-17-5	5	1,900.00
ACX675-17-6	6	1,900.00
ACX675-17-7	7	1,900.00
ACX675-17-8	8	1,900.00
ACX675-17-9	9	1,900.00
ACX675-17-10	10	1,900.00
ACX675-17-11	11	1,900.00
ACX675-17-12	12	1,900.00
ACX675-17-13	13	1,900.00
ACX675-17-(*)	14 thru 26	1,200.00
ACX675-17-(*)	27 thru 39	1,200.00
ACX675-17-(*)	40 thru 53	1,200.00
ACX675-17-(*)	54 thru 69	1,200.00

*Insert channel number

Reducer 50 ohm — Page 266

Line Size	Type	Price $ U.S.
1⅝" to ⅞"	1860A	152.00
3⅛" to 1⅝"	1861	220.00
6⅛" to 3⅛"	1872	1,120.00

Tower Adaptors — Page 270

Type Number	Description	Price $ U.S.
13555A	Angle Adaptor	18.00
13550	Round Member Adaptor	17.00

Circular Waveguide for UHF-TV — Pages 272 and 273:

Available on system basis. Contact Andrew for quotation. F.O.B. Orland Park, Illinois

Optical Fiber Products — Pages 274-276:

Many available configurations. Contact Andrew for quotation. F.O.B. Orland Park, Illinois

Pressurization — Pages 277-285

F.O.B. Richardson, Texas except where otherwise specified.

Pressurization Equipment — Pages 277-285

Type Number	Description	Price $ U.S.	
Dehydrators — Page 279			
1920E	120 V, 60 Hz	1,910.00	
1921E	120 V, 50 Hz	2,070.00	
1924E	230 V, 50 Hz	2,170.00	
1930C	120 V, 60 Hz	1,380.00	
1931C	120 V, 50 Hz	1,540.00	
1934C	230 V, 50 Hz	1,640.00	
40525A	120 V, 60 Hz	650.00	
40525A-2	120 V, 60 Hz	740.00	
40525A-3	230 V, 50 Hz	750.00	
40525A-4	120 V, 60 Hz	700.00	
40525A-5	230 V, 50 Hz	760.00	
65630B	120V, 60 Hz	980.00	
163903	230V, 50 Hz	1,040.00	
78200-24	24 V, DC	1,630.00	C
78200-48	48 V, DC	1,630.00	C

C F.O.B. Whitby, Ontario, Canada

Pressurization Equipment — Pages 277-285 *(continued)*

Type Number	Description	Price $ U.S.	
Spare Parts for Dehydrators — Page 279			
39878	For 1920E, 1921E, 1924E	77.00	
40486	For 1930C, 1931C, 1934C	31.00	
39795-2	For 40525A Series	26.00	
78199-24	For 78200-24	55.00	C
78199-48	For 78200-48	55.00	C
210	Replacement Desiccant	17.00	
Horn Antenna Pressurization — Page 280			
48921	Lectrodryer	On App.	O
48094	Pressurization Kit	On App.	O
43849	Pressure Relief Kit	65.00	O
Low Pressure Systems — Pages 282, 283			
42996A	Low Pressure Regulator	225.00	
42969	Nitrogen Tank Fitting	460.00	
39210	Kit for ESA Systems, 120 V, 60 Hz	2,320.00	
39210-2	Kit for ESA Systems, 230 V, 50 Hz	2,580.00	
31614-3	Regulating Tank	385.00	
42813	Regulating Tank, Low Pressure	730.00	
163305	Dehydrator Control/Monitor	2,070.00	
30900	Floor Stand	210.00	
30895	Wall Shelf, for 1930C, 40525A	95.00	
30896	Wall Shelf, for 1920E	142.00	
878A	Hand Pump	335.00	
10195	Spare Hose for 878A	11.00	
210	Silica Gel Refill	17.00	
Static Desiccator — Page 282			
107238-21	CPR137G, PDR70	400.00	B
107238-22	UG343B/U, UG344/U, PAR70	400.00	B
107238-23	CPR112G, PDR84	380.00	B
107238-24	UG51/U, PBR84	380.00	B
107109-21	CPR90G, PDR100	370.00	B
107238-25	PDR120	370.00	B
107238-26	WR75 choke or cover, PBR120	370.00	B
107238-27	PDR140	380.00	B
107238-28	UG595/U, UG596A/U, PBR220	370.00	B
107112	Replacement Desiccant	10.00	B
Pressurization Monitor — Page 283			
40004A	Monitor	980.00	
40004A-2	Monitor	1,020.00	
40004A-3	Monitor	430.00	
40004A-4	Monitor	300.00	
40004B-5	Monitor	800.00	
40004B-6	Monitor	1,380.00	
40004B-7	Monitor	1,420.00	

Type Number	Description	Price $ U.S.
Gas Distribution Manifolds — Page 284		
6600C-2	2 Outlet, Standard	145.00
6600C-4	4 Outlet, Standard	205.00
6600C-6	6 Outlet, Standard	265.00
L6600C-2	2 Outlet, Low Pressure	210.00
L6600C-4	4 Outlet, Low Pressure	320.00
Pressurization Accessories — Pages 284, 285		
31618-4	Pressure Sensor Switch	110.00
858C	Nitrogen Tank Fitting	250.00
35751	Nitrogen Tank Adaptor	35.00
18991A-1	Gauge Assembly, 0-30 lb./in.^{2}	22.00
18991A-2	Gauge Assembly, 0-15 lb./in.^{2}	26.00
3500A	Pressure Gauge, 0-15 lb./in.^{2}	11.20
3500A-2	Pressure Gauge, 0-15 lb./in.^{2}	12.60
33117-2	Pressure Gauge, 0-5 lb./in^2	34.00
33117-5	Pressure Gauge, 0-5 lb./in^2	34.50
42459	Mounting Rack, ¼″ Tubing	7.80
42459-3	Mounting Rack,½″ Tubing	8.50
164004-1	Mounting Strap, ⅜″ Tubing	3.10
164004-2	Mounting Strap, ½″ Tubing	3.20
25435-4	Polyethylene Tubing, ¼″	0.25/ft.
25435-5	Polyethylene Tubing, ⅜″	0.35/ft.
25435-8	Polyethylene Tubing, ½″	0.45/ft.
164027	Nylon Tie Kit	2.10
210	Silica Gel Refill	17.00
3017	Gas Inlet Valve, ⅛″ Thread	2.10
3017-2	Gas Inlet Valve, ¼″ Thread	2.10
3027	Release Valve, ⅛″ Thread	6.70
4949	Shut Off Valve, ⅛″ Thread	9.30
3028	Pipe Tee, ⅛″ Thread	1.65
3022	Street Tee, ⅛″ Thread	2.10
25436-42	Hex Pipe Nipple, ⅛″ Thread	1.30
25436-52	Hex Pipe Nipple, ¼″ Thread	1.65
25436-61	Male Connector for ¼″ Tubing, ¼″ Thread	2.50
25436-63	Male Connector for ⅜″ Tubing, ¼″ Thread	2.90
25436-20	Male Connector for ¼″ Tubing, ⅛″ Thread	2.90
25436-68	Male Connector for ⅜″ Tubing, ⅛″ Thread	2.90
25436-84	Male Connector for ½″ Tubing, ⅛″ Thread	3.10
25436-21	Elbow for ¼″ Tubing	2.90
25436-4	Elbow for ⅜″ Tubing	3.70
25436-85	Elbow for ½″ Tubing	3.90
25436-81	Tubing Tee for ⅜″ Tubing	5.50
25436-519	Tubing Tee for ¼″ Tubing	5.10
3018	Pipe Plug, ⅛″ Thread	1.20
3012A	Teflon Tape	3.10

Towers — Pages 286-300:

Many available configurations. Contact Andrew for quotation. F.O.B. Denton, Texas

GRASIS® Equipment Shelters — Pages 301-311:

Many available configurations. Contact Andrew for quotation. F.O.B. Denton, Texas

B F.O.B. Lochgelly, Fife, Great Britain C F.O.B. Whitby, Ontario, Canada O F.O.B. Orland Park, Illinois

Prices in Type Number Sequence

Terms

This price list covers the product line presented in Catalog 33. Prices and specifications are subject to change without notice. Firm quotations are available for specific time periods. Prices as listed are F.O.B. Orland Park, Illinois where noted O; Denton, Texas where noted D; Richardson, Texas where noted R; Campbellfield, Victoria, Australia where noted A; Lochgelly, Fife, Great Britain where noted B; or Whitby, Ontario, Canada where noted C; freight collect, and do not include export packing, insurance, taxes, tariffs, or duties. For international shipments, quotations may be obtained F.O.B. plant, F.A.S. port of departure, or C.I.F. port of entry. Refundable deposits are charged for some skids and large size cable reels in the Shipping Information section. All orders are subject to a minimum charge of $50.00 net. All orders are subject to acceptance by Andrew at corporate headquarters.

Type No.	Price	Page	F.O.B.
A			
AAC100	On App.	127	R
ACX			
ACX350-1	$ 610.00	263	O
ACX350-2	610.00	263	O
ACX350-3	610.00	263	O
ACX350-4	500.00	263	O
ACX350-5	450.00	263	O
ACX350-11	70.00	271	O
ACX350-12	110.00	270	O
ACX350-14	50.00	271	O
ACX350-15	90.00	271	O
ACX350-20	60.00	268	O
ACX350-31	585.00	263	O
ACX350-32	585.00	263	O
ACX350-33	585.00	263	O
ACX350-34	535.00	263	O
ACX350-35	485.00	263	O
ACX350-37	125.00	268	O
ACX450-1	925.00	263	O
ACX450-2	925.00	263	O
ACX450-3	925.00	263	O
ACX450-4	1,050.00	263	O
ACX450-5	950.00	263	O
ACX450-10	600.00	265	O
ACX450-11	85.00	271	O
ACX450-12	150.00	270	O
ACX450-13	80.00	271	O
ACX450-14	50.00	271	O
ACX450-15	150.00	271	O
ACX450-16	550.00	266	O
ACX450-20	100.00	268	O
ACX450-21	14.00	269	O
ACX450-27	95.00	268	O
ACX450-28	85.00	269	O
ACX450-31	890.00	263	O
ACX450-32	890.00	263	O
ACX450-33	890.00	263	O
ACX450-34	835.00	263	O
ACX450-35	780.00	263	O
ACX450-37	190.00	268	O
ACX650-1	1,575.00	263	O
ACX650-2	1,575.00	263	O
ACX650-3	1,575.00	263	O
ACX650-4	1,450.00	263	O
ACX650-5	1,300.00	263	O
ACX650-10	1,000.00	265	O
ACX650-16	1,200.00	266	O
ACX650-20	200.00	268	O
ACX650-31	1,475.00	263	O
ACX650-32	1,475.00	263	O
ACX650-33	1,475.00	263	O
ACX650-34	1,375.00	263	O
ACX650-35	1,275.00	263	O
ACX675-1	1,425.00	263	O
ACX675-2	1,425.00	263	O
ACX675-3	1,425.00	263	O
ACX675-4	1,450.00	263	O
ACX675-5	1,200.00	263	O
ACX675-10	1,000.00	265	O
ACX675-11	185.00	271	O
ACX675-12	210.00	270	O
ACX675-13	120.00	270	O
ACX675-14	75.00	271	O
ACX675-15	275.00	271	O
ACX675-16	1,000.00	266	O
ACX675-17	On App.	266	O
ACX675-20	160.00	268	O
ACX675-21	20.00	269	O
ACX675-27	125.00	268	O
ACX675-28	80.00	269	O
ACX675-31	1,325.00	263	O
ACX675-32	1,325.00	263	O

Type No.	Price	Page	F.O.B.
ACX675-33	$1,325.00	263	O
ACX675-34	1,225.00	263	O
ACX675-35	1,125.00	263	O
ACX675-37	270.00	268	O
AP-AS			
APC100	On App.	127	R
ASC1000	On App.	N	R
ASR300	On App.	132	R
ATW SERIES			
	On App.	134-140	O
B-C-D-E			
BVS12	On App.	306	D
BVS24	On App.	306	D
CQS-100	On App.	171	A
D22480	On App.	306 311	D
E21570	On App.	306 311	D
E21590	On App.	306 311	D
E21595	On App.	306 311	D
ESA			
ESA12P-124	On App.	126	D
ESA15-11	On App.	116	D
ESA15-12	On App.	116	D
ESA15-13	On App.	116	D
ESA18-11	On App.	116	D
ESA18-12	On App.	116	D
ESA18-13	On App.	116	D
ESA18-114	On App.	114	D
ESA18-124	On App.	114	D
ESA18-134	On App.	114	D
ESA18VST-124	On App.	120	D
ESA23VM-114	On App.	118	D
ESA23VM-124	On App.	118	D
ESA23VM-134	On App.	118	D
ESA24-114	On App.	115	D
ESA24-124	On App.	115	D
ESA24-134	On App.	115	D
ESA30-114	On App.	115	D
ESA30-124	On App.	115	D
ESA30-134	On App.	115	D
ESA37-114A	On App.	112	D
ESA37-124A	On App.	112	D
ESA37-134A	On App.	112	D
ESA42-203	On App.	117	D
ESA42-203CP	On App.	117	D
ESA45-4A	On App.	102	D
ESA45-46B	On App.	102	D
ESA45-412	On App.	124	D
ESA45M-4	On App.	122	D
ESA45M-12	On App.	122	D
ESA45M-46	On App.	122	D
ESA45M-124	On App.	122	D
ESA46-114	On App.	110	D
ESA46-124	On App.	110	D
ESA46-134	On App.	110	D
ESA46M-114	On App.	122	D
ESA46M-124	On App.	122	D
ESA46M-134	On App.	122	D
ESA56-114B	On App.	108	D
ESA56-124B	On App.	108	D
ESA56-134B	On App.	108	D
ESA68-114	On App.	106	D
ESA68-124	On App.	106	D
ESA68-134	On App.	106	D
ESA73-4A	On App.	100	D
ESA73-4CPA	On App.	100	D
ESA73-46A	On App.	100	D
ESA73-46CWA	On App.	100	D
ESA80-114A	On App.	104	D
ESA80-124A	On App.	104	D

Type No.	Price	Page	F.O.B.
ESA80-134A	On App.	104	D
ESA91-4A	On App.	98	D
ESA91-4CPA	On App.	98	D
ESA91-46A	On App.	98	D
ESA91-46CWA	On App.	98	D
ESA120-4A	On App.	96	D
ESA120-4CPA	On App.	96	D
ESA120-46A	On App.	96	D
ESA120-46CWA	On App.	96	D
EW			
EW17	$28.00/ft.	188	O
EW20	22.80/ft.	188	O
EW28	20.40/ft.	188	O
EW34	18.20/ft.	188	O
EW37	16.70/ft.	188	O
EW44	14.50/ft.	188	O
EW52	13.50/ft.	188	O
EW63	11.80/ft.	189	O
EW64	11.75/ft.	189	O
EW77	11.60/ft.	189	O
EW85	10.30/ft.	189	O
EW90	10.60/ft.	189	O
EW127A	9.50/ft.	189	O
EW132	9.50/ft.	189	O
EW180	7.65/ft.	189	O
EW220	7.40/ft.	189	O
EWP			
EWP17	29.70/ft.	186	O
EWP34	19.70/ft.	186	O
EWP37	18.40/ft.	186	O
EWP37S	19.40/ft.	185	O
EWP44	15.90/ft.	186	O
EWP52	15.00/ft.	186	O
EWP52S	16.00/ft.	185	O
EWP63	13.10/ft.	187	O
EWP63S	14.10/ft.	185	O
EWP64	13.00/ft.	187	O
EWP77	12.80/ft.	187	O
EWP90	11.80/ft.	187	O
EWP90S	12.80/ft.	185	O
EWP127A	10.70/ft.	187	O
EWP132	10.70/ft.	187	O
EWP180	8.65/ft.	187	O
EWP220	8.40/ft.	187	O
EWS44	19.70/ft.	188	O
FCS SERIES			
	On App.	309	D
FH			
FHJ1-50	1.04/ft.	222	O
FHJ5-75	4.70/ft.	228	O
FHR4	On App.	83	B
FHR4-E	On App.	83	B
FHR6	On App.	83	B
FHR6-E	On App.	83	B
FHR8	On App.	83	B
FHR8-E	On App.	83	B
FHR10	On App.	83	B
FHR10-E	On App.	83	B
FHR12	On App.	83	B
FHR12-E	On App.	83	B
FP			
FP4-23D	On App.	65	B
FP4-25D	On App.	66	B
FP4-71	On App.	71	B
FP4F-15E	On App.	59	B
FP4F-23D	On App.	65	B
FP4F-25D	On App.	66	B
FP6-23D	On App.	65	B
FP6-25D	On App.	66	B
FP6-64	On App.	70	B
FP6-71	On App.	71	B

Type No.	Price	Page	F.O.B.
FP6-77G	On App.	73	B
FP6F-15E	On App.	59	B
FP6F-23D	On App.	65	B
FP6F-25D	On App.	66	B
FP8-17D	On App.	60	B
FP8-19D	On App.	62	B
FP8-23D	On App.	65	B
FP8-25D	On App.	66	B
FP8-59	On App.	69	B
FP8-64	On App.	70	B
FP8-71	On App.	71	B
FP8-77G	On App.	73	B
FP8F-15E	On App.	59	B
FP8F-17D	On App.	60	B
FP8F-19D	On App.	63	B
FP8F-23D	On App.	65	B
FP8F-25D	On App.	66	B
FP10-17D	On App.	60	B
FP10-19D	On App.	62	B
FP10-23D	On App.	65	B
FP10-25D	On App.	66	B
FP10-34	On App.	67	B
FP10-36	On App.	67	B
FP10-59	On App.	69	B
FP10-64	On App.	70	B
FP10-71	On App.	71	B
FP10-77G	On App.	73	B
FP10F-15D	On App.	59	B
FP10F-17D	On App.	60	B
FP10F-19D	On App.	63	B
FP10F-23D	On App.	65	B
FP10F-25D	On App.	66	B
FP12-17D	On App.	60	B
FP12-19D	On App.	62	B
FP12-23D	On App.	65	B
FP12-25D	On App.	66	B
FP12-34	On App.	67	B
FP12-36	On App.	67	B
FP12-59	On App.	69	B
FP12-64	On App.	70	B
FP12-71	On App.	71	B
FP12-77G	On App.	73	B
FP12F-15D	On App.	59	B
FP12F-17D	On App.	60	B
FP12F-19D	On App.	63	B
FP12F-23D	On App.	65	B
FP12F-25D	On App.	66	B
FPX			
FPX6-23C	On App.	65	B
FPX6-25C	On App.	66	B
FPX6-64	On App.	70	B
FPX6-71	On App.	71	B
FPX6-77G	On App.	73	B
FPX8-17	On App.	60	B
FPX8-19	On App.	62	B
FPX8-23C	On App.	65	B
FPX8-25C	On App.	66	B
FPX8-59	On App.	69	B
FPX8-64	On App.	70	B
FPX8-71	On App.	71	B
FPX10-17	On App.	60	B
FPX10-19	On App.	62	B
FPX10-23C	On App.	65	B
FPX10-25C	On App.	66	B
FPX10-36	On App.	67	B
FPX10-59	On App.	69	B
FPX10-64	On App.	70	B
FPX10-71	On App.	71	B
FPX12-17	On App.	60	B
FPX12-19	On App.	62	B
FPX12-23C	On App.	65	B
FPX12-25C	On App.	66	B
FPX12-36	On App.	67	B

Type No.	Price	Page	F.O.B.
FPX12-59	On App.	69	B
FPX12-64	On App.	70	B
FPX12-71	On App.	71	B

FR-FS-FT

Type No.	Price	Page	F.O.B.
FR4	On App.	83	B
FR4-E	On App.	83	B
FR6	On App.	83	B
FR6-E	On App.	83	B
FR8	On App.	83	B
FR8-E	On App.	83	B
FR10	On App.	83	B
FR10-E	On App.	83	B
FR12	On App.	83	B
FR12-E	On App.	83	B
FSJ1-50	$ 1.20/ft.	222	O
FSJ1-75	1.20/ft.	222	O
FSJ4-50B	2.70/ft.	224	O
FSJ4-75A	2.70/ft.	224	O
FT4-50	6.70/ft.	N	O
FT4-50T	8.90/ft.	N	O
FT5-50	11.20/ft.	N	O
FT5-50T	19.00/ft.	N	O

GES SERIES

Type No.	Price	Page	F.O.B.
	On App.	304	D

GP

Type No.	Price	Page	F.O.B.
GP4F-17	1,320.00	61	D
GP4F-890A	1,000.00	59	D
GP6F-17A	1,675.00	61	D
GP6F-18A	1,675.00	61	D
GP6F-19A	1,675.00	63	D
GP6F-21A	1,675.00	64	D
GP6F-25A	1,675.00	67	D
GP6F-890A	1,400.00	59	D
GP8F-17A	2,610.00	61	D
GP8F-18A	2,610.00	61	D
GP8F-19A	2,610.00	63	D
GP8F-21A	2,610.00	64	D
GP8F-25A	2,610.00	67	D
GP8F-890A	2,200.00	59	D
GP10F-17A	3,530.00	61	D
GP10F-18A	3,530.00	61	D
GP10F-19A	3,530.00	63	D
GP10F-21A	3,530.00	64	D
GP10F-25A	3,530.00	67	D
GP10F-890A	3,050.00	59	D
GP12F-17	6,100.00	61	D
GP12F-18	6,100.00	61	D
GP12F-19	6,000.00	63	D
GP12F-21	6,000.00	64	D
GP12F-890	5,440.00	59	D
GP15F-17	12,800.00	61	D
GP15F-18	12,800.00	61	D
GP15F-19	12,800.00	63	D
GP15F-21	12,800.00	64	D

GPL

Type No.	Price	Page	F.O.B.
GPL6-17A	1,820.00	60	D
GPL6-18	1,820.00	61	D
GPL6-19A	1,820.00	63	D
GPL6-21	1,820.00	64	D
GPL6-25A	1,820.00	66	D
GPL8-17A	2,740.00	60	D
GPL8-18	2,740.00	61	D
GPL8-19A	2,740.00	63	D
GPL8-21	2,740.00	64	D
GPL8-25A	2,740.00	66	D
GPL10-17A	3,680.00	60	D
GPL10-18	3,680.00	61	D
GPL10-19A	3,680.00	63	D
GPL10-21	3,680.00	64	D
GPL10-25A	3,680.00	66	D
GPL12-17A	6,150.00	60	D
GPL12-18	6,150.00	61	D
GPL12-19A	6,150.00	63	D
GPL12-21	6,150.00	64	D
GPL15-17A	13,000.00	60	D
GPL15-18	13,000.00	61	D
GPL15-19A	13,000.00	63	D
GPL15-21	13,000.00	64	D

HJ

Type No.	Price	Page	F.O.B.
HJ4-50	3.02/ft.	232	O
HJ4-75	3.02/ft.	N	O
HJ5-50	5.58/ft.	234	O
HJ5-75	5.58/ft.	234	O
HJ5P-50	6.42/ft.	234 242	O
HJ7-50A	$ 12.00/ft.	236	O
HJ7-75	12.00/ft.	236	O
HJ7P-50A	13.85/ft.	236 242	O
HJ7SP-50A	14.35/ft.	236 242	O
HJ8-50B	22.30/ft.	238	O
HJ9-50	35.30/ft.	238	O
HJ11-50	24.30/ft.	238	O
HJ12-50	17.00/ft.	N	O

HMD

Type No.	Price	Page	F.O.B.
HMD8HC	4,330.00	143	O
HMD8HC-W	4,980.00	143	O
HMD8HO	4,330.00	143	O
HMD8HO-W	4,980.00	143	O
HMD8VC	4,330.00	143	O
HMD8VC-W	4,980.00	143	O
HMD8VO	4,330.00	143	O
HMD8VO-W	4,980.00	143	O
HMD12HC	6,720.00	143	O
HMD12HC-W	7,730.00	143	O
HMD12HO	6,720.00	143	O
HMD12HO-W	7,730.00	143	O
HMD12VC	6,720.00	143	O
HMD12VC-W	7,730.00	143	O
HMD12VO	6,720.00	143	O
HMD12VO-W	7,730.00	143	O
HMD16HC	9,470.00	143	O
HMD16HC-W	10,890.00	143	O
HMD16HO	9,470.00	143	O
HMD16HO-W	10,890.00	143	O
HMD16VC	9,470.00	143	O
HMD16VC-W	10,890.00	143	O
HMD16VO	9,470.00	143	O
HMD16VO-W	10,890.00	143	O
HMD24HC	15,350.00	143	O
HMD24HC-W	17,650.00	143	O
HMD24VC	15,350.00	143	O
HMD24VC-W	17,650.00	143	O
HMD32HC	21,000.00	143	O
HMD32HC-W	24,150.00	143	O
HMD32VC	21,000.00	143	O
HMD32VC-W	24,150.00	143	O

HP

Type No.	Price	Page	F.O.B.
HP2-180E	1,440.00	77	D
HP2-220	1,440.00	77	D
HP4-180E	2,160.00	77	D
HP4-220A	2,160.00	77	D
HP6-17C	6,230.00	60	D
HP6-18	6,230.00	61	D
HP6-19D	6,230.00	62	D
HP6-25D	6,230.00	66	D
HP6-44E	6,230.00	68	D
HP6-65E	5,720.00	70	D
HP6-71D	6,230.00	71	D
HP6-71GE	6,230.00	71	D
HP6-71W	6,230.00	N	D
HP6-77GE	6,230.00	73	D
HP6-82C	6,430.00	73	D
HP6-122D	6,130.00	75	D
HP6-180E	3,860.00	77	D
HP6-220	3,860.00	77	D
HP6F-17C	6,230.00	60	D
HP6F-18	6,230.00	61	D
HP6F-19C	6,230.00	62	D
HP8-17D	8,260.00	60	D
HP8-18	8,260.00	61	D
HP8-19D	8,260.00	62	D
HP8-21	8,260.00	64	D
HP8-25D	8,260.00	66	D
HP8-44E	8,260.00	68	D
HP8-65E	7,490.00	70	D
HP8-71D	8,260.00	71	D
HP8-71GE	8,260.00	71	D
HP8-71W	8,260.00	N	D
HP8-77GE	8,260.00	73	D
HP8-82C	8,460.00	73	D
HP8-122D	7,930.00	75	D
HP8-611D	9,400.00	80	D
HP8F-17C	8,260.00	60	D
HP8F-18	8,260.00	61	D
HP8F-19C	8,260.00	62	D
HP8F-21	8,260.00	64	D
HP10-17D	10,100.00	60	D
HP10-18	10,100.00	61	D
HP10-19D	10,100.00	62	D
HP10-21	10,100.00	64	D
HP10-25D	10,100.00	66	D
HP10-44E	10,100.00	68	D
HP10-65E	$ 9,480.00	70	D
HP10-71D	10,100.00	71	D
HP10-71GE	10,100.00	71	D
HP10-71W	10,100.00	N	D
HP10-77GE	10,100.00	73	D
HP10-82C	10,300.00	73	D
HP10-122D	9,990.00	75	D
HP10-611E	11,500.00	80	D
HP10-782C	On App.	80	D
HP10F-17C	10,100.00	60	D
HP10F-18	10,100.00	61	D
HP10F-19C	10,100.00	62	D
HP10F-21	10,100.00	64	D
HP12-17E	14,100.00	60	D
HP12-18	14,100.00	61	D
HP12-19E	14,100.00	62	D
HP12-21	14,100.00	64	D
HP12-25D	14,100.00	66	D
HP12-44F	14,100.00	68	D
HP12-65E	12,800.00	70	D
HP12-71E	14,100.00	71	D
HP12-71GF	14,100.00	71	D
HP12-77GF	14,100.00	73	D
HP12-82C	14,300.00	73	D
HP12-122E	13,600.00	75	D
HP12-611F	15,100.00	80	D
HP12-782C	On App.	80	D
HP12F-17C	14,100.00	60	D
HP12F-18	14,100.00	61	D
HP12F-19C	14,100.00	62	D
HP12F-21	14,100.00	64	D
HP15-17D	21,200.00	60	D
HP15-19D	21,200.00	62	D
HP15-44E	21,200.00	68	D
HP15-65D	20,200.00	70	D
HP15-71D	21,200.00	71	D
HP15-71GE	21,200.00	71	D
HP15-77GE	21,200.00	73	D
HP15-82C	21,400.00	73	D
HP15-782C	On App.	80	D

HPX

Type No.	Price	Page	F.O.B.
HPX2-180	1,790.00	77	D
HPX4-180	2,620.00	77	D
HPX6-44D	7,150.00	68	D
HPX6-71E	7,150.00	71	D
HPX6-82C	7,350.00	73	D
HPX6-122D	6,950.00	75	D
HPX6-127D	6,950.00	75	D
HPX6-180	4,260.00	77	D
HPX8-19C	9,900.00	62	D
HPX8-44D	9,200.00	68	D
HPX8-71E	9,200.00	71	D
HPX8-82C	9,400.00	73	D
HPX8-122D	8,750.00	75	D
HPX8-127D	8,750.00	75	D
HPX8F-19	11,800.00	62	D
HPX10-19D	11,900.00	62	D
HPX10-44D	11,200.00	68	D
HPX10-71E	11,200.00	71	D
HPX10-82C	11,400.00	73	D
HPX10-122C	10,900.00	75	D
HPX10-127C	10,900.00	75	D
HPX10F-19	13,700.00	62	D
HPX12-19D	15,800.00	62	D
HPX12-44D	15,300.00	68	D
HPX12-71E	15,000.00	71	D
HPX12-82C	15,200.00	73	D
HPX12-122C	14,500.00	75	D
HPX12-127C	14,500.00	75	D
HPX12-6511C	On App.	80	D
HPX15-19D	22,400.00	62	D
HPX15-71D	22,400.00	71	D
HPX15-82C	22,600.00	73	D

HR-HT

Type No.	Price	Page	F.O.B.
HR2E	535.00	83	D
HR4D	940.00	83	D
HR6D	1,200.00	83	D
HR8G	2,000.00	83	D
HR10G	2,650.00	83	D
HR12F	3,840.00	83	D
HT4-50	6.20/ft.	232	O
HT5-50	11.40/ft.	232	O
HT6	600.00	87	D
HT6M	On App.	87	B
HT10	1,250.00	87	D
HT10M	On App.	87	B

HXPD

Type No.	Price	Page	F.O.B.
HXPD6-77GC	$ 9,080.00	72	D
HXPD6-144	On App.	N	D
HXPD8-77GC	11,400.00	72	D
HXPD8-107C	11,400.00	74	D
HXPD8-144	On App.	N	D
HXPD10-77GC	13,750.00	72	D
HXPD10-107C	13,750.00	74	D
HXPD12-58	On App.	69	B
HXPD12-77GC	18,400.00	72	D

KP

Type No.	Price	Page	F.O.B.
KP4-15	1,120.00	59	B
KP4-17	1,120.00	61	B
KP4-19	1,120.00	63	B
KP4-23	1,120.00	65	B
KP4-25	1,120.00	67	B
KP4F-15	1,120.00	59	B
KP4F-17	1,120.00	61	B
KP4F-19	1,120.00	63	B
KP4F-23	1,120.00	65	B
KP4F-25	1,120.00	67	B
KP6-15A	1,490.00	59	B
KP6-17	1,490.00	61	B
KP6-19	1,490.00	63	B
KP6-23	1,490.00	65	B
KP6-25	1,490.00	67	B
KP6-335A	1,020.00	58	O
KP6-365A	1,020.00	58	O
KP6-403A	1,020.00	58	O
KP6-820A	1,020.00	58	O
KP6F-15A	1,490.00	59	B
KP6F-17	1,490.00	61	B
KP6F-19	1,490.00	63	B
KP6F-23	1,490.00	65	B
KP6F-25	1,490.00	67	B
KP8-15	2,260.00	59	B
KP8-17	2,260.00	61	B
KP8-19	2,260.00	63	B
KP8-23	2,260.00	65	B
KP8-25	2,260.00	67	B
KP8F-15	2,260.00	59	B
KP8F-17	2,260.00	61	B
KP8F-19	2,260.00	63	B
KP8F-23	2,260.00	65	B
KP8F-25	2,260.00	67	B
KP10-15B	3,130.00	59	B
KP10-17	3,130.00	61	B
KP10-19	3,130.00	63	B
KP10-23	3,130.00	65	B
KP10-25	3,130.00	67	B
KP10-335A	2,250.00	58	O
KP10-365A	2,250.00	58	O
KP10-403A	2,250.00	58	O
KP10-820A	2,250.00	58	O
KP10F-15B	3,130.00	59	B
KP10F-17	3,130.00	61	B
KP10F-19	3,130.00	63	B
KP10F-23	3,130.00	65	B
KP10F-25	3,130.00	67	B
KP13-15	5,330.00	59	B
KP13-17	5,330.00	61	B
KP13-19	5,330.00	63	B
KP13-23	5,330.00	65	B
KP13-25	5,330.00	67	B
KP13-335B	3,880.00	58	O
KP13-365B	3,880.00	58	O
KP13-403B	3,880.00	58	O
KP13-820B	3,880.00	58	O
KP13F-15	5,330.00	59	B
KP13F-17	5,330.00	61	B
KP13F-19	5,330.00	63	B
KP13F-23	5,330.00	65	B
KP13F-25	5,330.00	67	B

KST

Type No.	Price	Page	F.O.B.
KST	On App.	292	D

L

Type No.		Price	Page	F.O.B.
L42EN	#1	54.00	N	O
L42ENT	#1	62.50	N	O
L42EW	#1	54.00	N	O
L42EWT	#1	62.50	N	O
L42N	#1	26.00	225	O
L42NT	#1	52.00	225	O
L42P	#1	33.00	225	O
L42U	#1	33.00	225	O
L42W	#1	26.00	225	O
L42WT	#1	52.00	225	O

Prices by Type Number

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment.

A Campbellfield, Victoria, Australia B Lochgelly, Fife, Great Britain D Denton, Texas O Orland Park, Illinois R Richardson, Texas

Type No.		Price	Page	F.O.B.
L44DF	#1	$ 115.00	227	O
L44DM	#1	78.00	227	O
L44EN	#1	54.00	227	O
L44EW	#1	54.00	227	O
L44F	#1	102.00	227	O
L44J	#1	84.00	227	O
L44M	#1	84.00	227	O
L44N	#1	23.70	227	O
L44N-70	#1	33.00	227	O
L44N-75	#1	27.00	227	O
L44P	#1	20.80	227	O
L44P-75	#1	26.00	227	O
L44R	#1	84.00	227	O
L44T	#1	94.00	227	O
L44U	#1	20.80	227	O
L44U-75	#1	26.00	227	O
L44W	#1	23.70	227	O
L44W-70	#1	33.00	227	O
L44W-75	#1	27.00	227	O
L44Z		82.00	227	O
L45DF	#1	135.00	229	O
L45DM	#1	88.00	229	O
L45F	#1	105.00	229	O
L45J	#1	130.00	229	O
L45L	#1	120.00	229	O
L45M	#1	120.00	229	O
L45N	#1	58.00	229	O
L45P	#1	55.00	229	O
L45R	#1	88.00	229	O
L45T	#1	110.00	229	O
L45U	#1	55.00	229	O
L45W	#1	58.00	229	O
L45Z		98.00	229	O
L46DF	#2	192.00	231	O
L46DM	#2	150.00	231	O
L46F	#2	160.00	231	O
L46L	#2	182.00	231	O
L46M	#2	182.00	231	O
L46N	#2	98.00	231	O
L46R	#2	166.00	231	O
L46S	#2	166.00	231	O
L46W	#2	98.00	231	O
L46Z		178.00	231	O
L47DF	#2	260.00	231	O
L47DM	#2	240.00	231	O
L47F	#2	225.00	231	O
L47L	#2	235.00	231	O
L47M	#2	235.00	231	O
L47N	#2	185.00	231	O
L47R	#2	210.00	231	O
L47S	#2	250.00	231	O
L47Z		235.00	231	O
L6600C-2		210.00	284	R
L6600C-4		320.00	284	R

LD

Type No.	Price	Page	F.O.B.
LD2-105C	620.00	74	D
LD2-122C	620.00	76	D
LD4-105C	925.00	74	D
LD4-122B	925.00	76	D
LD6-105C	1,200.00	74	D
LD6-122B	1,200.00	76	D
LDF2-50	1.38/ft.	224	O
LDF4-50A	1.80/ft.	226	O
LDF4-75A	1.80/ft.	226	O
LDF4P-50A	2.10/ft.	226, 240	O
LDF5-50A	4.70/ft.	228	O
LDF5P-50A	5.48/ft.	228, 240	O
LDF6-50	8.10/ft.	230	O
LDF6P-50	9.15/ft.	230, 240	O
LDF7-50A	11.10/ft.	230	O
LDF7P-50A	12.30/ft.	230, 240	O
LDX4-122B	1,600.00	76	D

LST

Type No.	Price	Page	F.O.B.
LST1	On App.	294	D
LST2	On App.	294	D
LST3	On App.	294	D
LST4	On App.	294	D

M

Type No.	Price	Page	F.O.B.
M10	185.00	87	D
M10M	On App.	87	B
M46	On App.	288	D
M54	On App.	288	D
M64	On App.	288	D
MKP-335A	On App.	58	O
MKP-403A	On App.	58	O
MKP-820B	On App.	58	O

P

Type No.	Price	Page	F.O.B.
P2-144D	$ 1,350.00	77	D
P4-9C	1,330.00	59	D
P4-15C	1,650.00	59	D
P4-65D	1,180.00	70	D
P4-71D	1,320.00	71	D
P4-71GD	1,350.00	71	D
P4-122D	1,340.00	75	D
P4-144D	2,170.00	77	D
P4F-15D	1,340.00	59	D
P4F-21C	1,220.00	64	D
P4F-23E	1,160.00	65	D
P4F-25D	1,160.00	66	D
P6-9C	1,570.00	59	D
P6-15C	1,990.00	59	D
P6-65D	1,420.00	70	D
P6-71D	1,550.00	71	D
P6-71GD	1,595.00	71	D
P6-122D	1,570.00	75	D
P6-144D	2,400.00	77	D
P6F-15D	1,630.00	59	D
P6F-17C	1,430.00	60	D
P6F-18C	1,430.00	61	D
P6F-19C	1,430.00	63	D
P6F-21C	1,670.00	64	D
P6F-23E	1,430.00	65	D
P6F-24C	1,430.00	65	D
P6F-25D	1,430.00	66	D
P8-9C	2,690.00	59	D
P8-15C	3,070.00	59	D
P8-65D	2,460.00	70	D
P8-71D	2,700.00	71	D
P8-71GE	2,760.00	71	D
P8-122D	2,690.00	75	D
P8-144E	3,450.00	77	D
P8-186	5,620.00	N	D
P8F-15D	2,650.00	59	D
P8F-17C	2,460.00	60	D
P8F-18C	2,460.00	61	D
P8F-19C	2,460.00	63	D
P8F-21C	2,460.00	64	D
P8F-23E	2,460.00	65	D
P8F-24C	2,460.00	65	D
P8F-25D	2,460.00	66	D
P10-9C	3,550.00	59	D
P10-15C	4,020.00	59	D
P10-65D	3,330.00	70	D
P10-71E	3,660.00	71	D
P10-71GE	3,720.00	71	D
P10-122E	3,550.00	75	D
P10-144E	4,370.00	77	D
P10-186	6,540.00	N	D
P10F-15D	3,440.00	59	D
P10F-17C	3,240.00	60	D
P10F-18C	3,240.00	61	D
P10F-19C	3,240.00	63	D
P10F-21C	3,240.00	64	D
P10F-23E	3,240.00	65	D
P10F-25D	3,240.00	66	D
P12-9E	7,800.00	59	D
P12-65E	6,950.00	70	D
P12-71F	7,800.00	71	D
P12-71GF	7,900.00	71	D
P12-122E	7,630.00	75	D
P12F-17C	7,250.00	60	D
P12F-19C	7,250.00	63	D
P12F-23E	7,250.00	65	D
P12F-25D	7,250.00	66	D
P15-9D	16,300.00	59	D
P15-65D	14,800.00	70	D
P15-71E	16,100.00	71	D
P15-71GD	16,200.00	71	D

PL

Type No.	Price	Page	F.O.B.
PL4-19C	1,660.00	63	D
PL4-44E	1,700.00	68	D
PL4-71D	1,450.00	71	D
PL4-71GD	1,500.00	71	D
PL4-77GD	1,500.00	73	D
PL4-107D	1,580.00	75	D
PL6-17C	1,910.00	60	D
PL6-18	1,910.00	61	D
PL6-19C	1,910.00	63	D
PL6-21C	2,130.00	64	D
PL6-23D	$ 1,910.00	65	D
PL6-25D	1,910.00	66	D
PL6-37E	2,520.00	67	D
PL6-44E	1,940.00	68	D
PL6-59D	1,700.00	69	D
PL6-65D	1,540.00	70	D
PL6-71D	1,700.00	71	D
PL6-71GD	1,770.00	71	D
PL6-77GE	1,770.00	73	D
PL6-82C	1,970.00	73	D
PL6-107D	1,820.00	75	D
PL8-17C	3,030.00	60	D
PL8-18	3,030.00	61	D
PL8-19C	3,030.00	63	D
PL8-21	3,030.00	64	D
PL8-23D	3,030.00	65	D
PL8-25D	3,030.00	66	D
PL8-37D	3,700.00	67	D
PL8-44E	3,100.00	68	D
PL8-59D	2,880.00	69	D
PL8-65D	2,600.00	70	D
PL8-71D	2,880.00	71	D
PL8-71GE	2,940.00	71	D
PL8-77GE	2,940.00	73	D
PL8-82C	3,140.00	73	D
PL8-107E	2,980.00	75	D
PL8-186C	5,620.00	80	D
PL10-17C	3,930.00	60	D
PL10-18	3,930.00	61	D
PL10-19C	3,930.00	63	D
PL10-21	3,930.00	64	D
PL10-23D	3,930.00	65	D
PL10-25D	3,930.00	66	D
PL10-37D	4,580.00	67	D
PL10-44E	4,090.00	68	D
PL10-59D	3,810.00	69	D
PL10-65D	3,470.00	70	D
PL10-71E	3,810.00	71	D
PL10-71GE	3,900.00	71	D
PL10-77GD	3,900.00	73	D
PL10-82C	4,100.00	73	D
PL10-107E	3,910.00	75	D
PL10-186C	6,540.00	80	D
PL12-17E	8,250.00	60	D
PL12-18	8,250.00	61	D
PL12-19E	8,250.00	63	D
PL12-21	8,250.00	64	D
PL12-23D	8,250.00	65	D
PL12-25D	8,250.00	66	D
PL12-37F	8,900.00	67	D
PL12-44G	8,400.00	68	D
PL12-59E	8,120.00	69	D
PL12-65E	7,320.00	70	D
PL12-71F	8,100.00	71	D
PL12-71GF	8,120.00	71	D
PL12-77GF	8,120.00	73	D
PL12-82C	8,320.00	73	D
PL12-107F	8,220.00	75	D
PL15-17D	16,700.00	60	D
PL15-19D	16,700.00	63	D
PL15-37D	17,200.00	67	D
PL15-44F	16,800.00	68	D
PL15-59D	16,500.00	69	D
PL15-65D	15,100.00	70	D
PL15-71E	16,400.00	71	D
PL15-71GD	16,400.00	71	D
PL15-77GD	16,400.00	73	D
PL15-82C	16,600.00	73	D

PM

Type No.	Price	Page	F.O.B.
PM10A	On App.	90	O

PX

Type No.	Price	Page	F.O.B.
PX4-122C	2,050.00	75	D
PX4-127C	2,050.00	75	D
PX4-144C	2,850.00	77	D
PX6-122C	2,350.00	75	D
PX6-127C	2,350.00	75	D
PX6-144C	3,410.00	77	D
PX8-122C	3,450.00	75	D
PX8-127C	3,450.00	75	D
PX8-144D	4,250.00	77	D
PX10-122C	4,350.00	75	D
PX10-127C	4,350.00	75	D
PX10-144D	5,150.00	77	D
PX12-122C	8,430.00	75	D
PX12-127C	8,430.00	75	D

PXL

Type No.	Price	Page	F.O.B.
PXL4-44	$ 2,810.00	68	D
PXL6-44	3,110.00	68	D
PXL6-59E	2,430.00	69	D
PXL6-65D	2,250.00	70	D
PXL6-71E	2,430.00	71	D
PXL6-82C	2,750.00	73	D
PXL6-107C	2,600.00	75	D
PXL8-18C	6,200.00	61	D
PXL8-19C	6,200.00	63	D
PXL8-44	4,070.00	68	D
PXL8-59D	3,620.00	69	D
PXL8-65D	3,300.00	70	D
PXL8-71E	3,630.00	71	D
PXL8-82C	3,830.00	73	D
PXL8-107C	3,680.00	75	D
PXL8F-19	7,540.00	63	D
PXL10-18C	6,950.00	61	D
PXL10-19C	6,950.00	63	D
PXL10-37D	5,380.00	67	D
PXL10-44	4,970.00	68	D
PXL10-59D	4,570.00	69	D
PXL10-65D	4,170.00	70	D
PXL10-71E	4,570.00	71	D
PXL10-82C	4,920.00	73	D
PXL10-107C	4,640.00	75	D
PXL10F-19	8,250.00	63	D
PXL12-18C	10,900.00	61	D
PXL12-19C	10,900.00	63	D
PXL12-37E	9,700.00	67	D
PXL12-44	9,300.00	68	D
PXL12-59F	8,940.00	69	D
PXL12-65E	8,120.00	70	D
PXL12-71E	8,900.00	71	D
PXL12-82C	9,100.00	73	D
PXL12-107D	9,020.00	75	D
PXL15-19C	18,600.00	63	D
PXL15-37D	18,000.00	67	D
PXL15-59E	17,300.00	69	D
PXL15-65E	15,900.00	70	D
PXL15-82C	17,400.00	73	D

R

Type No.	Price	Page	F.O.B.
R2D	250.00	83	D
R4D	440.00	83	D
R6D	635.00	83	D
R8E	1,150.00	83	D
R10E	1,750.00	83	D
R12F	2,600.00	83	D
R24	On App.	288	D

RX

Type No.	Price	Page	F.O.B.
RX4-1	2.52/ft.	259	O
RX4-1R	2.90/ft.	259	O
RX4-2A	3.20/ft.	259	O
RX4-2R	3.65/ft.	259	O
RX4-3A	3.20/ft.	259	O
RX4-3R	3.65/ft.	259	O
RX5-1	5.45/ft.	259	O
RX5-1R	6.25/ft.	259	O

SHX

Type No.	Price	Page	F.O.B.
SHX10B1	On App.	88	O
SHX10C1	On App.	88	O

T

Type No.	Price	Page	F.O.B.
T6MSB	On App.	86	B
T6SB	320.00	86	D
T10MSB	On App.	86	B
T10SB	590.00	86	D
T12MSA	On App.	86	B
T12SA	930.00	86	D
TACA	On App.	298	D
TACB	On App.	297	D
TACBP	On App.	297	D
TACC	On App.	296	D
TACG	On App.	298	D
TACI	On App.	298	D
TACL	On App.	298	D
TACN	On App.	298	D
TACP	On App.	298	D
TACS	On App.	296	D
TACV	On App.	296	D
TACW	On App.	297	D
TMB10A	On App.	90	D
TMP10A	On App.	90	D

UGX

Type No.	Price	Page	F.O.B.
UGX10R-59C	13,000.00	69	D
UGX10R-107E	13,000.00	74	D
UGX12R-59D	17,200.00	69	D

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment. #2 For cable or waveguide assemblies 50 ft. or less, add $20.00 per connector attachment.

B Lochgelly, Fife, Great Britain D Denton, Texas O Orland Park, Illinois R Richardson, Texas

UHP

Type No.		Price	Page	F.O.B.
UHP8-18		$ 9,370.00	N	D
UHP8-21		9,370.00	64	D
UHP8F-18		9,370.00	N	D
UHP8F-21		9,370.00	64	D
UHP10-18		11,400.00	N	D
UHP10-21		11,400.00	64	D
UHP10F-18		11,400.00	N	D
UHP10F-21		11,400.00	64	D
UHP12-18		15,800.00	N	D
UHP12-21		15,800.00	64	D
UHP12F-18		15,800.00	N	D
UHP12F-21		15,800.00	64	D

UHX

Type No.		Price	Page	F.O.B.
UHX4-105		5,600.00	74	D
UHX4-107		5,600.00	74	D
UHX6-59H		8,840.00	69	D
UHX6-65D		8,340.00	70	D
UHX6-77GD		8,540.00	72	D
UHX6-107H		8,840.00	74	D
UHX8-34C		On App.	67	D
UHX8-35D		On App.	67	D
UHX8-37H		11,740.00	67	D
UHX8-59H		11,120.00	69	D
UHX8-65D		10,300.00	70	D
UHX8-77GD		10,600.00	72	D
UHX8-107H		11,120.00	74	D
UHX8-127H		10,600.00	75	D
UHX10-21		12,950.00	N	D
UHX10-34C		On App.	67	D
UHX10-35C		On App.	67	D
UHX10-37H		14,300.00	67	D
UHX10-56C		On App.	69	D
UHX10-59H		13,550.00	69	D
UHX10-59J		13,550.00	69	D
UHX10-65D		12,850.00	70	D
UHX10-107H		13,550.00	74	D
UHX10-127H		13,050.00	75	D
UHX10A-59		On App.	69	D
UHX10X-59C		14,100.00	69	D
UHX10X-65		14,150.00	N	D
UHX12-21		17,700.00	N	D
UHX12-34C		On App.	67	D
UHX12-35D		On App.	67	D
UHX12-37H		18,850.00	67	D
UHX12-56C		On App.	69	D
UHX12-59H		18,100.00	69	D
UHX12-59J		18,800.00	69	D
UHX12-65J		18,000.00	70	D
UHX12-107H		18,100.00	74	D
UHX12X-59C		18,700.00	69	D
UHX15-34C		On App.	67	D
UHX15-35C		On App.	67	D
UHX15-37H		23,900.00	67	D
UHX15-59H		23,600.00	69	D
UHX15-65E		22,400.00	70	D
UHX15-77GD		22,800.00	72	D

UMX

Type No.		Price	Page	F.O.B.
UMX10-459B		17,700.00	80	D
UMX10-611A		22,900.00	80	D
UMX12-459A		22,200.00	80	D
UMX12-A465		On App.	80	D
UMX12-B465		On App.	80	D

V

Type No.		Price	Page	F.O.B.
VT6B		440.00	87	D
VT6MB		On App.	87	B
VT10		760.00	87	D
VT10M		On App.	87	B

3-4

Type No.		Price	Page	F.O.B.
3ST		On App.	292	D
4ST		On App.	292	D
4SHT		On App.	292	D

41-45

Type No.		Price	Page	F.O.B.
41EN	#1	62.40	223	O
41ENS	#1	68.00	223	O
41ENT	#1	68.00	223	O
41EW	#1	60.40	223	O
41EWS	#1	68.00	223	O
41EWT	#1	66.00	223	O
41N	#1	33.80	223	O
41P	#1	33.80	223	O
41SCM	#1	20.00	N	O
41SEW	#1	49.00	223	O
41SJ	#1	$ 77.00	223	O
41SN-70	#1	37.00	223	O
41SNS	#1	60.00	223	O
41SP	#1	6.25	223	O
41SW	#1	9.35	223	O
41SW-70	#1	37.00	223	O
41SW-75	#1	9.40	N	O
41SWS	#1	60.00	223	O
41SWT	#1	32.80	223	O
41SWT-75	#1	17.50	223	O
41U	#1	39.50	223	O
41W	#1	33.80	223	O
44AN	#1	27.00	261	O
44AP	#1	25.00	261	O
44ASCM	#1	30.00	N	O
44ASGR	#1	120.00	225	O
44ASJ	#1	77.00	225	O
44ASN	#1	27.00	225	O
44ASN-75	#1	31.20	225	O
44ASP	#1	27.00	225	O
44ASP-75	#1	31.20	225	O
44ASR	#1	98.00	225	O
44ASU	#1	27.00	225	O
44ASU-75	#1	31.20	225	O
44ASW	#1	27.00	225	O
44ASW-75	#1	31.20	225	O
44AU	#1	25.00	261	O
44AW	#1	27.00	261	O
45AN	#1	68.00	261	O
45AN-75	#1	88.00	229	O
45AP	#1	64.00	261	O
45AU	#1	64.00	261	O
45AW	#1	68.00	261	O

74-87

Type No.		Price	Page	F.O.B.
74AN	#1	71.00	233	O
74AW	#1	71.00	233	O
74AW-70	#1	98.00	N	O
74T	#1	On App.	233	O
74U	#1	On App.	233	O
74Z		177.00	233	O
75AG	#1	140.00	233 235	O
75AGT	#1	325.00	243	O
75AM	#1	162.00	233 235	O
75AM-75	#1	230.00	235	O
75AN	#1	73.00	233 235	O
75AN-75	#1	162.00	235	O
75AR	#1	97.00	233 235	O
75AR-75	#1	185.00	235	O
75ART	#1	286.00	243	O
75AT	#1	175.00	233 235	O
75AT-75	#1	240.00	235	O
75AU	#1	77.00	233 235	O
75AU-75	#1	225.00	235	O
75AW	#1	73.00	233 235	O
75AW-75	#1	185.00	235	O
75AZ		108.00	233 235	O
75AZ-75	#1	280.00	235	O
75DM	#1	295.00	233 235	O
75GT		325.00	243	O
75NT		250.00	243	O
75RT		286.00	243	O
75WT		250.00	243	O
77AN-75	#2	On App.	237	O
77AR-75	#2	On App.	237	O
77AZ-75		On App.	237	O
78AGF	#2	355.00	239	O
78AGM	#2	365.00	239	O
78ARF	#2	335.00	239	O
78ARM	#2	345.00	239	O
78AS	#2	435.00	239	O
78BZ		430.00	239	O
79AG	#2	1,080.00	239	O
79AR	#2	1,030.00	239	O
79AZ		1,130.00	239	O
81GF	#2	540.00	239	O
81RF	#2	530.00	239	O
81Z		620.00	239	O
82N	#2	250.00	N	O
82R	#2	$ 260.00	N	O
82Z		340.00	N	O
87G	#2	218.00	237	O
87L	#2	275.00	237	O
87N	#2	192.00	237	O
87NT		380.00	243	O
87R	#2	192.00	237	O
87S	#2	228.00	237	O
87SG	#2	260.00	237	O
87SGT		490.00	243	O
87ST		440.00	243	O
87T	#2	300.00	237	O
87WT		460.00	243	O
87Z		275.00	237	O

117-290

Type No.		Price	Page	F.O.B.
117E	#2	1,020.00	188	O
117ET		1,050.00	186	O
117RT		1,070.00	186	O
117RT-3		1,050.00	186	O
117Z		980.00	192	O
120E	#2	980.00	188	O
120R	#2	1,080.00	188	O
120R-3	#2	1,060.00	188	O
120Z		940.00	192	O
128AE	#2	740.00	188	O
128AZ		870.00	192	O
134DE	#2	425.00	188	O
134DEP-1		440.00	186	O
134DEP-2		440.00	186	O
134DET		440.00	186	O
134DZ		450.00	192	O
137DE	#2	355.00	188	O
137DEP-1		375.00	186	O
137DEP-2		375.00	186	O
137DET		375.00	186	O
137DZ		380.00	192	O
144DC	#2	325.00	188	O
144DC-3	#2	325.00	188	O
144DCT		340.00	186	O
144DE	#2	330.00	188	O
144DE-3	#2	330.00	188	O
144DEP-1		345.00	186	O
144DET		345.00	186	O
144DZ		380.00	192	O
152DE	#2	320.00	188	O
152DEP-1		335.00	186	O
152DET		335.00	186	O
152DZ		270.00	192	O
163DC	#2	200.00	189	O
163DCP-1		215.00	187	O
163DCP-2		215.00	187	O
163DCT		215.00	187	O
163DE	#2	210.00	189	O
163DEP-1		225.00	N	O
163DEP-2		225.00	187	O
163DET		225.00	187	O
163DZ		245.00	192	O
164DC	#2	200.00	189	O
164DCP-1		225.00	187	O
164DCT		215.00	187	O
164DE	#2	210.00	189	O
164DEP-1		225.00	187	O
164DET		225.00	187	O
164DZ		245.00	192	O
177DC	#2	215.00	189	O
177DCP-1		230.00	187	O
177DCP-2		230.00	187	O
177DCT		230.00	187	O
177DE	#2	225.00	189	O
177DEP-1		240.00	187	O
177DEP-2		240.00	187	O
177DET		240.00	187	O
177DZ		250.00	192	O
185AC	#2	180.00	189	O
185AZ		265.00	192	O
190DE	#2	225.00	189	O
190DEP-1		240.00	187	O
190DEP-2		240.00	187	O
190DET		240.00	187	O
190DZ		235.00	192	O
210		17.00	284	R
252DC	#2	310.00	188	O
252DCT		325.00	186	O
252DE	#2	315.00	188	O
252DEP-1		330.00	186	O
252DET		$ 330.00	186	O
264DE	#2	235.00	189	O
264DEP-1		260.00	187	O
264DET		260.00	187	O
290SC		260.00	187 189	O

356-878

Type No.		Price	Page	F.O.B.
356-1		On App.	169	B
356-2		On App.	169	B
356-3		On App.	169	B
365-1		On App.	168	B
365-2		On App.	168	B
465-1		On App.	168	B
520G		On App.	170	B
534-1		On App.	168	B
534-2		On App.	168	B
542-1		On App.	168	B
543-1		On App.	168	B
544-1		On App.	168	B
545-2		On App.	168	B
546-1		On App.	168	B
555-8		On App.	168	B
557		On App.	170	B
558-1		On App.	168	B
561		400.00	263	O
561-11		385.00	263	O
561-21		365.00	263	O
562-1		On App.	168	B
562A		680.00	263	O
562A-11		660.00	263	O
562A-21		610.00	263	O
567-1		On App.	169	B
568-1		On App.	169	B
569-1		On App.	169	B
570-1		On App.	168	B
573-1		On App.	168	B
574-1		On App.	168	B
575-1		On App.	168	B
575-3		On App.	168	B
575-5		On App.	168	B
576-1		On App.	168	B
579		On App.	170	B
747CD-2		On App.	161	B
747CD-3		On App.	161	B
747CD-7		On App.	161	B
747CD-9		On App.	161	B
747CD-11		On App.	161	B
747CD-42		On App.	161	B
747CD-43		On App.	161	B
747CD-44		On App.	161	B
747CD-47		On App.	161	B
747CD-49		On App.	161	B
747FCD-2		On App.	161	B
747FCD-3		On App.	161	B
747FCD-7		On App.	161	B
747FCD-9		On App.	161	B
747FCD-11		On App.	161	B
747FCD-42		On App.	161	B
747FCD-43		On App.	161	B
747FCD-44		On App.	161	B
747FCD-47		On App.	161	B
747FCD-49		On App.	161	B
794		On App.	151	B
858C		250.00	284	R
878A		335.00	283	R

1060-1934

Type No.		Price	Page	F.O.B.
1060A		130.00	233 265	O
1061A		190.00	265	O
1061A-3		94.00	265	O
1062A		340.00	239 265	O
1062A-3		180.00	265	O
1073		1,200.00	239	O
1127DC	#2	210.00	189	O
1127DCP-3		225.00	187	O
1127DCT		225.00	187	O
1127DE	#2	220.00	189	O
1127DEP-3		235.00	187	O
1127DET		235.00	187	O
1127DK	#2	225.00	189	O
1127DKT		250.00	187	O
1127DZ		225.00	192	O
1132DC	#2	245.00	189	O
1132DCT		260.00	187	O
1132DE	#2	245.00	189	O
1132DEP-1		260.00	187	O

Prices by Type Number

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment. #2 For cable or waveguide assemblies 50 ft. or less, add $20.00 per connector attachment.

B Lochgelly, Fife, Great Britain D Denton, Texas O Orland Park, Illinois R Richardson, Texas

Type No.		Price	Page	F.O.B.
1132DET		$ 260.00	187	O
1132DZ		280.00	192	O
1162		370.00	265	O
1180DC	#2	235.00	189	O
1180DCP-1		250.00	187	O
1180DCT		250.00	187	O
1180DZ		205.00	192	O
1220ASC		200.00	187	O
			189	
1220DZ		180.00	192	O
1260A		135.00	233	O
			266	
1261B		186.00	237	O
			266	
1262B		340.00	266	O
1560A		44.00	268	O
1561A		68.00	268	O
1703		On App.	163	B
1765-101		On App.	159	B
1765-120		On App.	159	B
1765-121		On App.	159	B
1765-122		On App.	159	B
1765-123		On App.	159	B
1794-1K		On App.	153	B
1794-3K		On App.	153	B
1794-5K		On App.	153	B
1794-7K		On App.	153	B
1794-9K		On App.	153	B
1794-101K		On App.	153	B
1794-101LF		On App.	153	B
1794-102K		On App.	153	B
1794-102LF		On App.	153	B
1794-103K		On App.	153	B
1794-104K		On App.	153	B
1794-105K		On App.	153	B
1794-106K		On App.	153	B
1794-107K		On App.	153	B
1794-108K		On App.	153	B
1794-109K		On App.	153	B
1794-110K		On App.	153	B
1860A		152.00	266	O
1861		220.00	239	O
			266	
1872		1,120.00	239	O
			266	
1920E		1,910.00	279	R
1921E		2,070.00	279	R
1924E		2,170.00	279	R
1930C		1,380.00	279	R
1931C		1,540.00	279	R
1934C		1,640.00	279	R

2001-2762A

Type No.		Price	Page	F.O.B.
2001-1-1K		On App.	150	B
2001-1-2K		On App.	150	B
2001-1-3K		On App.	150	B
2001-1-4K		On App.	150	B
2001-2-1K		On App.	150	B
2001-2-2K		On App.	150	B
2001-2-3K		On App.	150	B
2001-2-4K		On App.	150	B
2001-3-1K		On App.	150	B
2001-3-2K		On App.	150	B
2001-3-3K		On App.	150	B
2001-3-4K		On App.	150	B
2004-2		On App.	167	B
2004-3		On App.	167	B
2004-4		On App.	167	B
2004-31		On App.	167	B
2004-32		On App.	167	B
2061		182.00	237	O
			267	
2062		375.00	239	O
			267	
2132DC	#2	280.00	189	O
2132DCP-1		295.00	187	O
2132DCT		295.00	187	O
2132DE	#2	280.00	189	O
2132DEP-1		295.00	187	O
2132DET		295.00	187	O
2132DK	#2	295.00	189	O
2132DKT		310.00	187	O
2260B		98.00	267	O
2261A		155.00	267	O
2262		325.00	267	O
2360A		158.00	267	O
2361A		195.00	267	O
2701		On App.	162	B
2702		On App.	162	B
2726		On App.	163	B
2731-1-1		On App.	165	B
2731-1-2		On App.	165	B
2731-1-3		On App.	165	B
2731-1-4		On App.	165	B
2731-2-1		On App.	165	B
2731-2-2		On App.	165	B
2731-2-3		On App.	165	B
2731-2-4		On App.	165	B
2731-11-41		On App.	165	B
2731-11-42		On App.	165	B
2731-21-41		On App.	165	B
2731-21-42		On App.	165	B
2753-1		On App.	155	B
2753-2		On App.	155	B
2753-4		On App.	155	B
2753-6		On App.	155	B
2753-8		On App.	155	B
2753T-6		On App.	155	B
2761-1		$200.00	263	O
		+12.50/ft.		
2761-11		190.00	263	O
		+12.50/ft.		
2761-21		158.00	263	O
		+12.50/ft.		
2762A-1		280.00	263	O
		+22.50/ft.		
2762A-11		260.00	263	O
		+22.50/ft.		
2762A-21		230.00	263	O
		+22.50/ft.		

3001-6600C

Type No.		Price	Page	F.O.B.
3001-2L		On App.	149	B
3001-2ML		On App.	149	B
3001-2VL		On App.	149	B
3001-3L		On App.	149	B
3001-3ML		On App.	149	B
3001-4L		On App.	149	B
3002-36M		On App.	149	B
3002-36S		On App.	149	B
3003-70MT		On App.	149	B
3004-70F		On App.	149	B
3004-90F		On App.	149	B
3012A		3.10	285	R
3017		2.10	285	R
3017-2		2.10	285	R
3018		1.20	285	R
3022		2.10	285	R
3027		6.70	285	R
3028		1.65	285	R
3065-101-1K		On App.	157	B
3065-101-2K		On App.	157	B
3065-101-3K		On App.	157	B
3065-102-1K		On App.	157	B
3065-102-2K		On App.	157	B
3065-102-3K		On App.	157	B
3065-103-1K		On App.	157	B
3065-103-2K		On App.	157	B
3065-103-3K		On App.	157	B
3065-104-1K		On App.	157	B
3065-104-2K		On App.	157	B
3065-104-3K		On App.	157	B
3065MT-113L-2T		On App.	157	B
3500A		11.20	284	R
3500A-2		12.60	284	R
3901		160.00	270	O
3902		170.00	270	O
3911		62.00	270	O
3912		76.00	270	O
3921		94.00	270	O
3922		96.00	270	O
4000SSAT		On App.	167	B
4094		On App.	151	B
4850A		62.00	268	O
4851		58.00	268	O
4852		62.00	268	O
4861A		51.00	268	O
4862A		92.00	268	O
4949		9.30	285	R
6600C-2		145.00	284	R
6600C-4		205.00	284	R
6600C-6		265.00	284	R

10000-19999

Type No.		Price	Page	F.O.B.
10195		11.00	283	R
10683-10		4.00	269	O
10683-197		2.10	269	O
10683-304		2.50	194	O
			205	
10683-305		$ 3.00	194	O
			205	
10683-307		3.30	194	O
			205	
10683-312		2.00	194	O
			205	
10683-319		2.10	194	O
			205	
10683-328		2.00	194	O
			205	
10683-329		2.10	194	O
			205	
10683-405		4.00	269	O
10683-406		3.00	269	O
10683-551		6.00	269	O
10804-9	#1	15.60	251	O
10804-11	#1	11.50	251	O
10804-17	#1	23.00	251	O
10804-66	#1	17.70	251	O
10805-4	#1	21.80	251	O
10805-5	#1	18.20	251	O
10805-6	#1	11.00	251	O
10805-11	#1	17.00	251	O
10805-12	#1	17.50	251	O
11662-2		19.20	255	O
11662-3		19.20	255	O
12395-1		43.00	255	O
13074A		55.00	223	O
13550		17.00	255	O
			270	
13555A		18.00	201	O
			270	
13924		42.00	269	O
13925		80.00	269	O
13927		54.00	269	O
			271	
14378		32.00	270	O
14379		50.00	269	O
15093A		61.00	239	O
			268	
15840		40.00	269	O
18041		37.00	268	O
18096		28.00	268	O
18200		60.00	268	O
18630		22.00	269	O
18631		27.00	269	O
18902		290.00	239	O
18991A-1		22.00	284	R
18991A-2		26.00	284	R
19007-42		52.00	207	O
19007-62		30.00	207	O
19007-75		26.50	207	O
19007-90		26.50	207	O
19007A-109		41.00	201	O
19007-112		26.50	207	O
19007-137		26.50	207	O
19007-159		26.50	207	O
19007-187		26.50	207	O
19007A-205		62.00	201	O
19007-229		32.00	207	O
19007A-269		67.00	201	O
19008-42		52.00	207	O
19008-62		30.00	207	O
19008-75		26.50	207	O
19008-90		26.50	207	O
19008A-109		35.00	201	O
19008-112		26.50	207	O
19008-137		26.50	207	O
19008-159		26.50	207	O
19008-187		26.50	207	O
19008-229		32.00	207	O
19009A-109		74.00	201	O
19009A-205		80.00	201	O
19009A-269		82.00	201	O
19045		125.00	205	O
		+8.75/ft.		
19045-60		150.00	205	O
19045-120		185.00	205	O
19051		120.00	205	O
		+8.75/ft.		
19051-60		145.00	205	O
19051-120		175.00	205	O
19065		125.00	205	O
		+8.75/ft.		
19065-60		150.00	205	O
19065-120		185.00	205	O
19075-12		235.00	205	O
19075-24		290.00	194	O
			205	
19075-36		$ 335.00	205	O
19209B		1,030.00	265	O
19256B		38.50	192	O
			255	

20000-29999

Type No.		Price	Page	F.O.B.
20695		620.00	265	O
23187		142.00	267	O
24312A		47.50	192	O
			255	
25190-5		1,000.00		O
		deposit		
25190-14		830.00		O
		deposit		
25190-25		680.00		O
		deposit		
25190-28		680.00		O
		deposit		
25190-37		1,200.00		O
		deposit		
25190-38		2,780.00		O
		deposit		
25190-39		2,300.00		O
		deposit		
25435-4		0.25/ft.	284	R
25435-5		0.35/ft.	198	R
			284	
25435-8		0.45/ft.	284	R
25436-4		3.70	285	R
25436-20		2.90	285	R
25436-21		2.90	285	R
25436-42		1.30	285	R
25436-52		1.65	285	R
25436-61		2.50	285	R
25436-63		2.90	285	R
25436-68		2.90	285	R
25436-81		5.50	285	R
25436-84		3.10	285	R
25436-85		3.90	285	R
25436-519		5.10	285	R
25816A-31		12.00/ft.	236	O
			247	
25831-2		6.80/ft.	234	O
			244	
25831-3		5.58/ft.	234	O
			247	
26016-2		7.20	255	O
26985A		73.00	192	O
			255	
27591-101		12.00/ft.	236	O
28030		4.70	194	O
			205	
29958		38.50	192	O
29961		38.50	192	O

30000-34999

Type No.		Price	Page	F.O.B.
30452		108.00	267	R
30848-1		125.00	191	O
			253	
30848-2		125.00	191	O
			253	
30848-3		128.00	191	O
			253	
30848-4		100.00	191	O
			253	
30848-5		98.00	191	O
			253	
30895		95.00	283	R
30896		142.00	283	R
30900		210.00	283	R
31031-1		140.00	255	O
31535		53.00	192	O
31614-3		385.00	283	R
31618-4		110.00	284	R
31619		6.50	194	O
			205	
31670-1		20.80	191	O
			253	
31670-2		23.00	191	O
			253	
31670-3		26.50	191	O
			253	
31670-4		27.00	191	O
			253	
31670-5		27.50	191	O
			253	
31766-9		70.00	190	O
31766-10		62.00	190	O
			253	

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment. #2 For cable or waveguide assemblies 50 ft. or less, add $20.00 per connector attachment.

B Lochgelly, Fife, Great Britain O Orland Park, Illinois R Richardson, Texas

Prices by Type Number

Type No.	Price	Page	F.O.B.
31766-11	$ 56.00	190	O
		253	
31766-13	38.00	190	O
31768A	57.00	191	O
		207	
31769-1	12.50	190	O
		253	
31769-4	32.00	253	O
31769-5	12.00	190	O
		253	
31771	14.00	191	O
		207	
31771-4	70.00	191	O
		207	
31771-5	104.00	253	O
31771-6	100.00	191	O
		207	
31771-9	20.00	191	O
		207	
31861	4.40	194	O
		205	
32299-5	190.00	261	O
32299-6	90.00	261	O
32349	4.40	194	O
		205	
32457-2	17.50	194	O
33117-2	34.00	284	R
33117-5	34.50	284	R
33544-10	65.00	192	O
33544-11	39.00	192	O
33544-17	16.00	192	O
33544-24	17.70	192	O
33544-32	18.00	192	O
33544-33	13.00	192	O
33544-34	13.00	192	O
33544-35	13.00	192	O
33544-37	13.00	192	O
33544-38	13.00	192	O
33544-39	16.50	192	O
33544-41	12.70	192	O
33544-42	18.50	192	O
33544-43	20.00	192	O
33544-44	13.00	192	O
33586-1	230.00	192	O
33586-2	230.00	192	O
33586-3	280.00	192	O
33586-4	1,060.00	192	O
33586-5	500.00	192	O
33586-7	240.00	192	O
33586-8	230.00	192	O
33586-9	230.00	192	O
33586-11	355.00	192	O
33598-5	85.00	253	O
33682	120.00	243	O
		251	
33938-5	140.00	256	O
33948-1	80.00	255	O
33948-2	52.00	255	O
33948-3	32.00	255	O
33948-4	62.00	255	O
33948-5	28.00	255	O
33948-6	40.00	N	O
33981A-1	83.00	253	O
34283	44.00	255	O
34389A	13.60	268	O
34660	27.00	237	O
		268	
34759	75.00	192	O
		255	
34767A-3	8.30	255	O
34767A-5	8.80	255	O
34767A-6	10.90	255	O
34767A-7	10.90	255	O
34767A-8	62.00	255	O
34767A-10	21.00	255	O
34767A-13	13.50	255	O
34767A-15	31.20	255	O
34767A-16	31.20	255	O
34767A-17	31.20	255	O
34767A-18	11.50	255	O
34767A-19	13.50	255	O
34767A-20	11.00	255	O
34767A-22	8.30	255	O
34767A-27	7.40	255	O
34767A-28	8.00	255	O
34767A-30	22.00	255	O
34767A-31	64.00	255	O
34767A-35	$ 15.00	255	O
34767A-36	9.40	255	O
34767A-38	5.90	255	O
34767A-39	8.00	255	O
34767A-43	11.40	255	O
34767A-44	22.00	N	O
34767A-46	15.00	N	O
34767A-47	15.00	N	O

35000-39999

Type No.	Price	Page	F.O.B.
35254-2	2,040.00	83	D
35255-2	1,600.00	83	D
35256-46	3,110.00	83	D
35257-41	2,140.00	83	D
35258-47	3,860.00	83	D
35259-42	2,575.00	83	D
35422-11	1.20/ft.	222	O
		246	
35422-14	2.08/ft.	226	O
		246	
35422-22	1.60/ft.	224	O
		246	
35751	35.00	284	R
35849-1	70.00	193	O
35849-3	70.00	193	O
35849-6	78.00	193	O
35849-7	78.00	193	O
35849-8	80.00	193	O
35849-9	115.00	193	O
35849-10	125.00	193	O
35849-11	70.00	193	O
35849-12	76.00	193	O
35849-13	120.00	193	O
35849-14	78.00	193	O
35849-15	70.00	193	O
35849-16	76.00	193	O
35849-17	94.00	193	O
35849-18	67.00	193	O
35849-19	62.00	193	O
36719	15.00	261	O
36720	10.90	261	O
38891A	170.00	87	D
39098-75	50.00	74	O
39098-187	On App.	68	O
39099-90	50.00	74	O
39099-112	50.00	70	O
		72	
39099-137	50.00	68	O
		70	
39099-137A	46.00	199	O
39099-229	105.00	66	O
39180	1,240.00	83	D
39181	1,600.00	83	D
39182	2,390.00	83	D
39183	3,090.00	83	D
39184	4,220.00	83	D
39191A	1,050.00	83	D
39192	1,740.00	83	D
39193	2,370.00	83	D
39194	3,600.00	83	D
39196	1,960.00	83	D
39197	2,625.00	83	D
39198	3,300.00	83	D
39199	4,740.00	83	D
39210	2,320.00	282	R
39210-2	2,580.00	282	R
39795-2	26.00	279	R
39816-96	75.00	247	O
39816-97	83.00	247	O
39816-100	70.00	247	O
39816-104	93.00	247	O
39816-105	102.00	247	O
39816-106	111.00	247	O
39816-107	120.00	247	O
39818A-208	98.00	247	O
39818A-209	112.00	247	O
39818A-210	125.00	247	O
39818A-211	138.00	247	O
39818A-212	152.00	247	O
39818A-240	74.00	247	O
39818A-241	82.00	247	O
39878	77.00	279	R

40000-42999

Type No.	Price	Page	F.O.B.
40004A	980.00	283	R
40004A-2	1,020.00	283	R
40004A-3	430.00	283	R
40004A-4	300.00	283	R
40004B-5	800.00	283	R
40004B-6	$1,380.00	283	R
40004B-7	1,420.00	283	R
40394-1	108.00	256	O
40394-2	120.00	256	O
40417	31.20	199	O
		255	
40430-1	10.50	255	O
40486	31.00	279	R
40502-37	350.00	195	O
40502-44	350.00	195	O
40502-52	350.00	195	O
40502-63	350.00	195	O
40502-90	350.00	195	O
40525A	650.00	279	R
40525A-2	740.00	279	R
40525A-3	750.00	279	R
40525A-4	700.00	279	R
40525A-5	760.00	279	R
40604	215.00	87	D
40611	12.00	194	O
40622 #1	7.80	223	O
40656-1	46.80	256	O
40656-2	66.50	256	O
40656-3	45.80	256	O
40656-5	57.20	256	O
40656-6	84.00	N	O
40785-1	14.90	261	O
40785-2	26.00	261	O
40954	10.80	261	O
40954-2	21.20	261	O
41108A-1	140.00	191	O
		253	
41108A-2	140.00	191	O
		253	
41108A-3	145.00	191	O
		253	
41656B	156.00	248	O
	+2.10/ft.		
41656B-3	122.00	240	O
41656B-6	128.00	240	O
41690-8	2.16/ft.	226	O
41690-9	5.58/ft.	228	O
41690-10	6.58/ft.	234	O
41690-11	14.15/ft.	236	O
41690-17	2.16/ft.	226	O
41690-18	1.52/ft.	222	O
41690-21	1.52/ft.	222	O
41690-22	1.26/ft.	222	O
41690-23	13.10/ft.	230	O
41690-24	3.16/ft.	224	O
41690-43	1.66/ft.	224	O
41690-44	3.16/ft.	224	O
41690-45	5.58/ft.	228	O
41690-46	9.62/ft.	230	O
41690-47	6.58/ft.	234	O
41690-48	14.15/ft.	236	O
41690-49	3.62/ft.	232	O
41690-51	3.62/ft.	N	O
41690-52	20.00/ft.	N	O
42125B	156.00	244	O
	+2.10/ft.	248	
42126B	156.00	244	O
	+2.10/ft.	248	
42128B-3	144.00	240	O
42128B-6	150.00	240	O
42140	170.00	236	O
	+13.40/ft.	245	
42141	175.00	238	O
	+25.00/ft.	245	
42142	175.00	238	O
	+39.20/ft.	245	
42144	175.00	238	O
	+27.00/ft.	245	
42150B-39	5.48/ft.	228	O
		244	
42150B-48	4.70/ft.	228	O
		247	
42151A-18	11.10/ft.	230	O
		247	
42152	230.00	261	O
42153	440.00	261	O
42154	540.00	261	O
42155	450.00	261	O
42156	560.00	261	O
42157	680.00	261	O
42166B	156.00	248	O
	+2.10/ft.		
42167B	156.00	244	O
	+2.10/ft.	248	
42168B	156.00	244	O
	+2.10/ft.	248	
42169B	$ 156.00	249	O
	+1.20/ft.		
42170B	156.00	249	O
	+1.20/ft.		
42171B	156.00	249	O
	+1.20/ft.		
42172B	156.00	249	O
	+1.20/ft.		
42173B	156.00	249	O
	+1.20/ft.		
42174B	156.00	249	O
	+1.20/ft.		
42175B	156.00	249	O
	+1.20/ft.		
42176B	156.00	249	O
	+1.20/ft.		
42178B	156.00	249	O
	+1.20/ft.		
42179B	156.00	249	O
	+1.20/ft.		
42180B	156.00	249	O
	+1.20/ft.		
42182B	156.00	249	O
	+1.20/ft.		
42183B	156.00	249	O
	+1.20/ft.		
42184B	156.00	249	O
	+1.20/ft.		
42188B	156.00	249	O
	+1.20/ft.		
42192	140.00	261	O
42193A	370.00	261	O
42194	390.00	261	O
42334	42.00	191	O
42394-11	50.00	246	O
	+1.20/ft.		
42394-14	50.00	246	O
	+2.08/ft.		
42394-22	50.00	246	O
	+1.60/ft.		
42396A-1	38.00	190	O
		253	
42396A-2	38.00	190	O
		253	
42396A-4	38.00	190	O
42396A-5	38.00	190	O
		253	
42396A-7	38.00	190	O
42396A-8	38.00	190	O
42396A-9	38.00	190	O
42396A-11	38.00	190	O
42396A-15	40.00	190	O
42416	54.00	261	O
42419	48.00	261	O
42459	7.80	284	R
42459-3	8.50	284	R
42579A	156.00	249	O
	+1.20/ft.		
42580A	156.00	249	O
	+1.20/ft.		
42813	730.00	283	R
42826 #2	1,370.00	239	O
42896 #2	1,350.00	239	O
42962A	156.00	249	O
	+1.20/ft.		
42963A	156.00	249	O
	+1.20/ft.		
42969	460.00	282	R
42996A	225.00	282	R

43000-49999

Type No.	Price	Page	F.O.B.
43004A	156.00	244	O
	+2.10/ft.	248	
43005A	156.00	244	O
	+2.10/ft.	248	
43042	36.50	261	O
43094	27.00	192	O
		255	
43130-1	150.00	253	O
43130-2	150.00	253	O
43130-3	150.00	253	O
43211	29.00	190	O
		253	
43552-2	70.00	248	O
43554-2	72.00	248	O
43557-2	75.00	248	O
43660-2	72.00	248	O
43716 #1	62.40	227	O
43734	225.00	60	O
		78	
43818-5	2.10/ft.	226	O
		244	

Prices by Type Number

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment. #2 For cable or waveguide assemblies 50 ft. or less, add $20.00 per connector attachment.

D Denton, Texas O Orland Park, Illinois R Richardson, Texas

ANDREW

Type No.	Price	Page	F.O.B.
43818-6	$ 2.10/ft.	226	O
		244	
43818-41	1.80/ft.	226	O
		247	
43818-42	2.10/ft.	226	O
		244	
43849	On App.	90	O
		280	
44202-3	122.00	240	O
44202-6	128.00	240	O
44612	190.00	261	O
44613	420.00	261	O
44614	490.00	261	O
44730-1	960.00	194	O
44910-1	940.00	194	O
44978-1	940.00	194	O
45029	940.00	194	O
45040-8	On App.	276	O
45040-9	On App.	276	O
45665-1	970.00	81	D
45665-2	1,290.00	81	D
45665-3	1,690.00	81	D
45665-4	2,000.00	81	D
45665-5	2,530.00	81	D
47470-67	On App.	91	O
47869A-1	3.08/ft.	224	O
		244	
47869A-11	3.08/ft.	224	O
		244	
47869A-12	3.08/ft.	224	O
		244	
48001	On App.	198	O
48001-2	On App.	198	O
48041 #1	188.00	241	O
48070 #1	18.00	227	O
48094	On App.	280	O
48100	44.00	248	O
48148	280.00	247	O
48280	On App.	274	O
48363A	125.00	244	O
	+3.08/ft.	249	
48364A	125.00	244	O
	+3.08/ft.	249	
48365A	125.00	249	O
	+3.08/ft.		
48366A	125.00	249	O
	+3.08/ft.		
48367A	125.00	244	O
	+3.08/ft.	249	
48368A	125.00	244	O
	+3.08/ft.	249	
48369A	125.00	244	O
	+3.08/ft.	249	
48370A	125.00	244	O
	+3.08/ft.	249	
48600A-1	590.00	196	O
48600A-2	665.00	196	O
48602	135.00	200	O
48603	175.00	200	O
48604	135.00	200	O
48605	On App.	91	O
48606	115.00	91	O
48607	405.00	200	O
48608	330.00	200	O
48609	380.00	199	O
48613A	445.00	196	O
	+21.50/ft.		
48613A-96	565.00	196	O
48613A-150	635.00	196	O
48614	22.00	200	O
48659-7	1.38/ft.	244	O
48659-10	1.38/ft.	222	O
		244	
48659-11	1.38/ft.	244	O
48695-3	122.00	240	O
48695-6	128.00	240	O
48760	On App.	91	O
48822	40.00	248	O
48921	On App.	280	O
48939-1	65.00	256	O
48939-2	85.00	256	O
48939-3	65.00	256	O
48939-4	65.00	256	O
48939-5	65.00	256	O
48939-6	65.00	N	O
48939-7	65.00	N	O
48939-8	65.00	N	O
48939-34	72.00	193	O
48939-37	72.00	193	O
48939-44	72.00	193	O
48939-52	$ 72.00	193	O
48939-63	72.00	193	O
48939-64	72.00	193	O
48939-77	72.00	193	O
48939-90	72.00	193	O
48939-122	72.00	193	O
48939-132	72.00	193	O
48939-180	72.00	193	O
48939-220	72.00	193	O
48940-1	46.00	193	O
		256	
48940-2	108.00	193	O
		256	
48940-3	135.00	193	O
		256	
48940-4	168.00	193	O
		256	
48940-6	228.00	193	O
		256	
48971	On App.	91	O
48973	On App.	91	O
48974	On App.	91	O
48976	On App.	91	O
48990	On App.	91	O
49000-62P-1	On App.	195	O
49000-75N-1	On App.	195	O
49000-90M-1	On App.	195	O
49000-112L-1	On App.	195	O
49000-137H-1	On App.	195	O
49000-137J-1	On App.	195	O
49000-137K-1	On App.	195	O
49000-159H-1	On App.	195	O
49000-187G-1	On App.	195	O
49000-229E-1	On App.	195	O
49000-229F-1	On App.	195	O
49000-284D-1	On App.	195	O
49000-340C-1	On App.	195	O
49000-430A-1	On App.	195	O
49000-430B-1	On App.	195	O
49001A	580.00	143	D
49002	1,050.00	143	D
49003	1,340.00	143	D
49008	115.00	200	O
49009	155.00	200	O
49010	145.00	200	O
49013	140.00	91	O
49158	On App.	90	O
49209	On App.	91	O
49486	11.75	200	O
		207	
49532-2	278.00	198	O
49532-3	275.00	198	O
49532-4	275.00	198	O
49545	860.00	91	O
		198	
49600 #1	56.00	225	O
49600-75 #1	62.00	225	O
49607	375.00	196	O
	+21.50/ft.		
49607-49	On App.	91	O
49607-150	585.00	196	O
49608	380.00	196	O
	+17.50/ft.		
49608-150	530.00	196	O
49608-240	665.00	196	O
49651 #1	36.50	N	O
49768A	92.00	248	O
49769A	92.00	248	O
49770A	92.00	248	O
49774-2	1.60/ft.	224	O
		244	
49774-3	1.60/ft.	224	O
		244	
49887	On App.	91	O
50000-54999			
51727-12	225.00	205	O
51727-24	280.00	194	O
		205	
51727-36	330.00	205	O
51737-12	215.00	205	O
51737-24	270.00	194	O
		205	
51737-36	325.00	205	O
51741	125.00	205	O
	+8.75/ft.		
51741-60	150.00	205	O
51741-120	$185.00	205	O
51747-12	255.00	205	O
51747-24	295.00	194	O
		205	
51747-36	340.00	205	O
52080	180.00	205	O
	+15.00/ft.		
52080-60	225.00	205	O
52080-120	290.00	205	O
52095-12	385.00	205	O
52095-24	450.00	194	O
		205	
52095-36	505.00	205	O
53015-42	160.00	205	O
53015-62	132.00	205	O
53015-75	122.00	205	O
53015-90	130.00	205	O
53015-112	142.00	205	O
53015-137	98.00	205	O
53015-187	162.00	205	O
53025-42	146.00	205	O
53025-62	122.00	205	O
53025-75	102.00	205	O
53025-90	110.00	205	O
53025-112	120.00	205	O
53025-137	86.00	205	O
53025-187	130.00	205	O
53210	100.00	205	O
	+8.75/ft.		
53210-60	130.00	205	O
53210-120	160.00	205	O
53215-12	290.00	205	O
53215-24	335.00	194	O
		205	
53215-36	385.00	205	O
53296	95.00	205	O
	+8.75/ft.		
53296-60	130.00	205	O
53296-120	170.00	205	O
53648-42	152.00	205	O
53648-62	132.00	205	O
53648-75	122.00	205	O
53648-90	134.00	205	O
53648-112	144.00	205	O
53648-137	168.00	205	O
53648-187	168.00	205	O
53896	8.75	200	O
53987	465.00	196	O
	+22.00/ft.		
53987-24	465.00	196	O
53988	385.00	196	O
	+22.00/ft.		
53988-240	800.00	196	O
53990A-1	915.00	197	O
53990A-3	915.00	197	O
54109	8.75	200	O
54345	270.00	196	O
	+10.20/ft.		
54345-24	275.00	196	O
54346	220.00	196	O
	+10.20/ft.		
54346-240	395.00	196	O
54348	110.00	199	O
54418-90	285.00	206	O
54418-112	285.00	206	O
54418-137	285.00	206	O
54418-159	300.00	206	O
54418-229	350.00	206	O
54762	128.00	199	O
54769	4.20	194	O
		205	
54827	45.00	200	O
55000-59999			
55000-42	36.00	194	O
		205	
55000-62	36.00	194	O
		205	
55000-75	36.00	194	O
		205	
55000-90	36.00	194	O
		205	
55000-112	36.00	194	O
		205	
55000-137	36.00	194	O
		205	
55000-187	36.00	194	O
		205	
55001-90	47.00	194	O
		205	
55001-112	47.00	194	O
		205	
55001-137	$ 47.00	194	O
		205	
55001-159	47.00	194	O
		205	
55001-187	47.00	194	O
		205	
55001-229	47.00	194	O
		205	
55001-284	94.00	194	O
55001-340	135.00	194	O
55040-42	220.00	207	O
55040-62	220.00	207	O
55040-75	220.00	207	O
55040-90	220.00	207	O
55040-112	220.00	207	O
55040-137	220.00	207	O
55040-159	230.00	207	O
55040-187	230.00	207	O
55040-229	230.00	207	O
55070	On App.	175	O
55072-90	4.40	194	O
		205	
55072-112	4.40	194	O
		205	
55072-137	4.60	194	O
		205	
55072-159	4.40	194	O
		205	
55072-187	5.60	194	O
		205	
55072-229	6.40	194	O
		205	
55072-284	9.40	194	O
55072-340	16.50	194	O
55219-90	13.40	205	O
55219-112	13.40	205	O
55219-137	13.00	205	O
55219-159	13.40	205	O
55219-187	13.40	205	O
55219-229	15.40	205	O
55220-42	145.00	205	O
55220-62	115.00	205	O
55220-75	115.00	205	O
55220-90	128.00	205	O
55220-112	128.00	205	O
55220-137	140.00	205	O
55220-187	205.00	205	O
55221-42	145.00	205	O
55221-62	115.00	205	O
55221-75	115.00	205	O
55221-90	128.00	205	O
55221-112	128.00	205	O
55221-137	140.00	205	O
55221-187	205.00	205	O
55222-42	150.00	205	O
55222-62	135.00	205	O
55222-75	135.00	205	O
55222-90	145.00	205	O
55222-112	145.00	205	O
55222-137	150.00	205	O
55222-187	205.00	205	O
55224-42	4.90	205	O
55224-62	5.10	205	O
55224-75	5.10	205	O
55224-90	5.00	205	O
55224-112	5.00	205	O
55224-137	5.00	205	O
55224-187	6.40	205	O
55243	On App.	175	O
55249-4	125.00	206	O
55402-90	200.00	205	O
55402-112	205.00	205	O
55402-137	205.00	205	O
55402-159	245.00	205	O
55402-187	340.00	205	O
55402-229	485.00	205	O
55403-90	200.00	205	O
55403-112	205.00	205	O
55403-137	205.00	205	O
55403-159	245.00	205	O
55403-187	340.00	205	O
55403-229	485.00	205	O
55407-90	200.00	205	O
55407-112	205.00	205	O
55407-137	205.00	205	O
55407-159	245.00	205	O
55407-187	340.00	205	O
55407-229	485.00	205	O

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment.
D Denton, Texas O Orland Park, Illinois

Prices by Type Number

Type No.	Price	Page	F.O.B.
55410	$160.00	205	O
	+ 10.50/ft.		
55410-60	175.00	205	O
55410-120	225.00	205	O
55411-12	295.00	205	O
55411-24	350.00	194	O
		205	
55411-36	400.00	205	O
55412	165.00	205	O
	+ 10.50/ft.		
55412-60	210.00	205	O
55412-120	245.00	205	O
55413-12	340.00	205	O
55413-24	395.00	194	O
		205	
55413-36	460.00	194	O
55414	165.00	205	O
	+ 10.50/ft		
55414-60	205.00	205	O
55414-120	240.00	205	O
55415-12	355.00	205	O
55415-24	405.00	194	O
		205	
55415-36	465.00	205	O
55416	260.00	205	O
	+ 12.00/ft.		
55416-60	250.00	205	O
55416-120	350.00	205	O
55417-12	440.00	205	O
55417-24	500.00	194	O
		205	
55417-36	530.00	205	O
55418	275.00	205	O
	+ 15.00/ft.		
55418-60	330.00	205	O
55418-120	400.00	205	O
55419-12	520.00	205	O
55419-24	575.00	194	O
		205	
55419-36	635.00	205	O
55420	345.00	205	O
	+ 34.00/ft.		
55420-60	490.00	205	O
55420-120	655.00	205	O
55421-12	530.00	205	O
55421-24	595.00	194	O
		205	
55421-36	685.00	205	O
55437-90	152.00	206	O
55437-112	152.00	206	O
55437-137	152.00	206	O
55437-159	158.00	206	O
55437-229	225.00	206	O
55520-3	On App.	176	C
55526-4	115.00	206	O
55648	435.00	198	O
55674-90	105.00	205	O
55674-112	105.00	205	O
55674-137	105.00	205	O
55674-159	110.00	205	O
55674-187	150.00	205	O
55674-229	150.00	205	O
55675-42	88.00	205	O
55675-62	88.00	205	O
55675-75	88.00	205	O
55675-90	88.00	205	O
55675-112	88.00	205	O
55675-137	102.00	205	O
55675-187	118.00	205	O
55688	5.40	194	O
		205	
55974-4	125.00	206	O
56045-90	112.00	N	O
56045-112	112.00	N	O
56045-137	112.00	N	O
56045-159	112.00	N	O
56045-187	180.00	N	O
56045-229	210.00	N	O
56207	45.00	200	O
57222A-107	730.00	197	O
57222A-122	730.00	197	O
57459A-2	990.00	197	O
57459A-3	990.00	197	O
57568	128.00	199	O
57569	47.00	200	O
57570-1	8.50	200	O
57585	On App.	174	C

Type No.	Price	Page	F.O.B.
57756	On App.	175	C
58016A-1	$ 990.00	197	O
58016A-3	990.00	197	O
58111	On App.	175	C
58135	On App.	175	C
58200-14	On App.	N	C
58249	850.00	142	O
58437	On App.	174	C
58700-14	On App.	174	C
59210-75	260.00	206	O
59210-90	260.00	206	O
59210-112	260.00	206	O
59210-137	265.00	206	O
59220-5	155.00	206	O
59220-6	170.00	206	O
59220-13	120.00	206	O
59220-24	240.00	206	O
59220-25	155.00	206	O
59220-30	145.00	206	O
59220-33	170.00	206	O
59220-37	170.00	206	O
59220-51	170.00	206	O
59220-100	160.00	206	O

60000-69999

Type No.	Price	Page	F.O.B.
60906-5	On App.	175	C
62422	1,640.00	142	O
62423	1,970.00	142	O
62795	175.00	142	O
62831-144	600.00	N	O
62832-122	600.00	N	O
62832-127	600.00	N	O
62833-107	600.00	N	O
62834	600.00	N	O
62835-59	600.00	N	O
62835-64	600.00	N	O
62837-44	700.00	N	O
62842-107	600.00	N	O
62843-71	600.00	N	O
62844-59	600.00	N	O
62844-64	600.00	N	O
62845-59	670.00	N	O
62846-44	700.00	N	O
62847-37	700.00	N	O
62866A-1	1,215.00	197	O
62866A-2	1,215.00	197	O
62900-75	150.00	199	O
62900-112	150.00	199	O
62900-137	150.00	78	O
		199	
62901-90	150.00	78	O
		199	
62901-112	160.00	78	O
		199	
62901-137	165.00	78	O
		199	
62901-159	230.00	199	O
62901-229	250.00	78	O
		199	
63100	On App.	175	C
63141	On App.	176	C
63152	2,480.00	142	O
63159	5,900.00	142	O
63160	6,400.00	142	O
63200-26	On App.	174	C
63305A-5	6,000.00	174	C
63500	2,850.00	142	O
63502A	6,100.00	142	O
63503	7,700.00	142	O
63609	On App.	176	B
63705	On App.	176	B
64100A-107	975.00	197	O
64100A-122	975.00	197	O
64104	450.00	142	O
64136A	1,380.00	197	O
64137A-1	1,380.00	197	O
64137A-2	1,380.00	197	O
64147A-1	1,215.00	197	O
64147A-2	1,215.00	197	O
64157A-1	990.00	197	O
64157A-2	990.00	197	O
64159A-1	1,215.00	197	O
64269	495.00	196	O
	+ 29.50/ft.		
64269-240	1,020.00	196	O
64270A	1,900.00	197	O

Type No.	Price	Page	F.O.B.
64271	$ 160.00	199	O
64272	58.00	200	O
64274A	1,130.00	197	O
64382	58.00	200	O
64412	9.30	200	O
64703A-1	1,215.00	197	O
64703A-2	1,215.00	197	O
64775-109	215.00	200	O
64775-166	225.00	200	O
64775-205	248.00	200	O
64775-269	285.00	200	O
64775-281	232.00	200	O
64848A-1	1,215.00	197	O
64848A-2	1,215.00	197	O
65168-24	575.00	205	O
65230-137	245.00	205	O
65230-159	275.00	205	O
65230-229	325.00	205	O
65233-1	1,565.00	197	O
65233-2	1,565.00	197	O
65234-1	1,300.00	197	O
65234-3	1,300.00	197	O
65235	1,565.00	197	O
65236-1	1,380.00	197	O
65236-2	1,380.00	197	O
65237-1	1,380.00	197	O
65238-1	1,380.00	197	O
65238-2	1,380.00	197	O
65239-1	1,210.00	197	O
65239-3	1,210.00	197	O
65240-1	1,210.00	197	O
65240-2	1,210.00	197	O
65241-107	1,160.00	197	O
65241-122	1,160.00	197	O
65242-107	960.00	197	O
65242-122	960.00	197	O
65316-1	1,380.00	197	O
65316-2	1,380.00	197	O
65321A-1	990.00	197	O
65321A-2	990.00	197	O
65322-1	1,210.00	197	O
65322-2	1,210.00	197	O
65323-2	1,210.00	197	O
65323-3	1,210.00	197	O
65324-1	1,380.00	197	O
65324-2	1,380.00	197	O
65325	1,500.00	197	O
65326	2,290.00	197	O
65456	575.00	196	O
	+ 29.50/ft.		
65456-24	610.00	196	O
65456-96	730.00	196	O
65500	195.00	201	O
65630B	980.00	279	R
66412-90	52.00	207	O
66412-137	54.00	207	O
66412-159	56.00	207	O
66412-229	62.00	207	O
66748-6	6.00	269	O
67549	740.00	197	O
67550	960.00	197	O
68573-166	585.00	196	O
68574-166	645.00	196	O
68998	975.00	197	O
68999	1,160.00	196	O
69021	430.00	196	O
	+ 17.50/ft.		
69021-24	435.00	196	O
69021-96	510.00	196	O
69021-150	590.00	196	O
69225-2	11.00	269	O
69226-2	13.00	269	O
69269	900.00	198	O
69270	850.00	198	O
69271	850.00	198	O
69272	850.00	198	O
69273	850.00	198	O
69277	850.00	198	O
69382	850.00	198	O
69383	1,215.00	197	O
69385	2,160.00	197	O
69485	2,180.00	199	O
69492	850.00	198	O
69585-18	420.00	198	O
69876	1,160.00	197	O

Type No.	Price	Page	F.O.B.
69877	$ 975.00	197	O
69907	2,390.00	199	O
69908	2,390.00	199	O
69910	2,180.00	199	O
69932	41.00	201	O
69933	35.00	201	O
69934	74.00	201	O

70000-99999

Type No.	Price	Page	F.O.B.
75645-1	175.00	87	D
75645-3	210.00	87	D
76496	4,290.00	83	D
77025	2,680.00	83	D
78199-24	55.00	279	C
78199-48	55.00	279	C
78200-24	1630.00	279	C
78200-48	1630.00	279	C
96000	700.00	89	O
	deposit		

100000-199999

Type No.	Price	Page	F.O.B.
100376	On App.	87	B
102733	On App.	83	B
102735	On App.	83	B
102737	On App.	83	B
103720	On App.	87	B
103730	On App.	176	B
103731	On App.	176	B
104140	4,500.00	93	O
104141	4,500.00	93	O
104300-2	220.00	241	O
		251	
107109-21	370.00	282	B
107112	10.00	282	B
107238-21	400.00	282	B
107238-22	400.00	282	B
107238-23	380.00	282	B
107238-24	380.00	282	B
107238-25	370.00	282	B
107238-26	370.00	282	B
107238-27	380.00	282	B
107238-28	370.00	282	B
120810-1	#1 52.00	225	O
124519	On App.	93	A
124520	On App.	93	A
124527-1	On App.	93	A
124527-2	On App.	93	A
124528-1	On App.	93	A
124528-2	On App.	93	A
124800-1	#1 156.00	229	O
124990-1	#1 145.00	227	O
160515-177	1,500.00	197	O
160516-177	1,500.00	197	O
162047-12	390.00	203	O
162047-24	435.00	203	O
162047-36	500.00	203	O
162048-12	600.00	203	O
162048-24	645.00	203	O
162048-36	700.00	203	O
162240	2,180.00	199	O
162615-12	565.00	203	O
162615-24	615.00	203	O
162615-36	670.00	203	O
163228-12	360.00	203	O
163228-24	400.00	203	O
163228-36	465.00	203	O
163305	2,070.00	283	R
163452	6,375.00	273	R
163619-12	320.00	205	O
163619-24	350.00	194	O
		205	
163619-36	400.00	205	O
163903	1,040.00	279	R
163950-90	310.00	206	O
163950-112	310.00	206	O
163950-137	310.00	206	O
163950-159	330.00	206	O
163950-229	380.00	206	O
164004-1	3.10	284	R
164004-2	3.20	284	R
164027	2.10	284	R

200000-299999

Type No.	Price	Page	F.O.B.
200480	240.00	80	D
200481	240.00	80	D
200807	105.00	199	O
200816	11,200.00	80	D
200834-3	157.00	240	O

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment.

A Campbellfield, Victoria, Australia   B Lochgelly, Fife, Great Britain   C Whitby, Ontario, Canada   D Denton, Texas   O Orland Park, Illinois   R Richardson, Texas

Type No.	Price	Page	F.O.B.
200834-6	$ 163.00	240	O
200970	88.00	201	O
201066	156.00	249	O
	+ 1.60/ft.		
201067	156.00	249	O
	+ 1.60/ft.		
201068	156.00	249	O
	+ 1.60/ft.		
201069	156.00	249	O
	+ 1.60/ft.		
201070	156.00	249	O
	+ 1.60/ft.		
201071	156.00	249	O
	+ 1.60/ft.		
201072	156.00	249	O
	+ 1.60/ft.		
201073	156.00	249	O
	+ 1.60/ft.		
201074A	156.00	244	O
	+ 1.60/ft.	249	
201075A	156.00	244	O
	+ 1.60/ft.	249	
201076A	156.00	249	O
	+ 1.60/ft.		
201077A	156.00	249	O
	+ 1.60/ft.		
201078A	156.00	244	O
	+ 1.60/ft.	249	
201079A	156.00	244	O
	+ 1.60/ft.	249	
201080A	156.00	249	O
	+ 1.60/ft.		
201081A	156.00	249	O
	+ 1.60/ft.		
201082A	145.00	249	O
	+ 1.38/ft.		
201083A	145.00	244	O
	+ 1.38/ft.	249	
201084A	145.00	244	O
	+ 1.38/ft.	249	
201085	145.00	244	O
	+ 1.38/ft.	249	
201122	87.00	248	O
201123	70.00	248	O
201124	79.00	248	O
201439	900.00	190	O
201632	210.00	87	D
201632-2	210.00	87	D
201759A	On App.	198	O
201942	230.00	231	O
202358	900.00	190	O
202376-3	230.00	240	O
202376-6	$ 236.00	240	O
202378	On App.	203	D
202378-2	On App.	203	D
202378-3	On App.	203	D
202421	900.00	190	O
202559	1,070.00	198	O
202638-3	152.00	36	O
202638-6	158.00	36	O
203105	2,575.00	89	O
203197	On App.	121	D
203361	220.00	241	O
203809	900.00	190	O
203978	3,500.00	80	D
203978-2	3,600.00	80	D
203979	3,950.00	80	D
203979-2	4,050.00	80	D
204526	On App.	90	O
204527	On App.	90	O
204528	On App.	90	O
204673-1	41.50	193	O
		256	
204673-2	41.50	193	O
		256	
204673-4	155.00	193	O
		256	
204673-8	245.00	193	O
		256	
204677	900.00	190	O
204679-1	65.00	256	O
204679-2	65.00	256	O
204679-3	65.00	256	O
204679-4	65.00	256	O
204679-5	65.00	N	O
204679-6	65.00	N	O
204679-7	65.00	N	O
204679-34	65.00	193	O
204679-37	65.00	193	O
204679-44	65.00	193	O
204679-52	65.00	193	O
204679-63	65.00	193	O
204679-64	65.00	193	O
204679-77	65.00	193	O
204679-90	65.00	193	O
204679-127	65.00	193	O
204679-132	65.00	193	O
204679-180	65.00	193	O
204679-220	65.00	193	O
204897	900.00	190	O
204919	850.00	190	O
204960	900.00	190	O
204989-1	19.00	192	O
		255	
204989-2	$ 24.00	192	O
		255	
204989-3	25.00	192	O
		255	
204989-4	25.00	192	O
		255	
204989-5	26.00	192	O
		255	
204989-6	37.00	192	O
		255	
204989-7	40.00	255	O
205127	800.00	190	O
205136	On App.	198	O
205137	1,045.00	198	O
205170	On App.	274	O
205360	8.10/ft.	230	O
		247	
205550	On App.	275	O
205551	On App.	275	O
205552	On App.	275	O
205555	On App.	275	O
205572	On App.	198	O
205594-75N-1	On App.	195	O
205869	900.00	190	O
205995	62.00	198	O
206135	900.00	190	O
206135-2	900.00	190	O
206161 #1	83.00	227	O
206267	1,650.00	80	D
206269	1,650.00	80	D
206326	On App.	89	O
206456	On App.	275	O
206610	On App.	275	O
206706-1	34.00	253	O
206706-2	43.00	253	O
206706-3	43.00	253	O
206706-4	43.00	253	O
206929-1	On App.	N	O
206929-4	On App.	N	O
206929-8	On App.	N	O
206930	On App.	N	O
207030	On App.	N	O
207032-1	3.52/ft.	244	O
207032-2	3.52/ft.	244	O
207033-1	1.38/ft.	244	O
207033-2	1.38/ft.	244	O
207038	145.00	244	O
	+ 1.38/ft.		
207039	$145.00	244	O
	+ 1.38/ft.		
207040	145.00	244	O
	+ 1.38/ft.		
207043	156.00	244	O
	+ 5.48/ft.		
207044	156.00	244	O
	+ 5.48/ft.		
207045	198.00	244	O
	+ 3.48/ft.		
207046	198.00	244	O
	+ 3.48/ft.		
207047	198.00	244	O
	+ 3.48/ft.		
207048	198.00	244	O
	+ 3.48/ft.		
207051	198.00	244	O
	+ 6.42/ft.		
207052	198.00	244	O
	+ 6.42/ft.		
207053	145.00	244	O
	+ 1.38/ft.		
207054	145.00	244	O
	+ 1.38/ft.		
207057	145.00	244	O
	+ 1.38/ft.		
207058	145.00	244	O
	+ 1.38/ft.		
207105	205.00	81	D
207106	620.00	81	D
207123-1	On App.	297	D
207123-2	On App.	297	D
207123-3	On App.	297	D
207760	17.00/ft.	N	O
207761	175.00	N	O
	+ 19.00/ft.		

300000-349999

Type No.	Price	Page	F.O.B.
322200-1	On App.	305	D
348213	On App.	296	D
348214	On App.	296	D
349044-1	On App.	91	D
349500-A1	On App.	299	D
349500-1B	On App.	299	D
349500-2B	On App.	299	D
349500-2BS	On App.	299	D
349501	On App.	299	D
349529	On App.	299	D

350000-399999

On App. 305-311 D

#1 For cable assemblies 50 ft. or less, add $10.00 per connector attachment.

D Denton, Texas O Orland Park, Illinois

The figures on the following pages are for guidance in planning transportation requirements. The information is subject to change and, therefore, should be considered approximate.

Microwave Antennas

General. 10 ft. (3.0 m) and larger antennas and molded radomes may require special handling in shipping, depending on destination and routing. For systems requiring a large number of antennas, special packs can be quoted to reduce shipping volume. For example, it is often convenient to pack all antennas for the same site in the same box. Andrew can also provide bulk transport and on-site assembly of antennas. Contact your local Andrew Sales Office for details.

One- and Two-Piece Antennas. Antennas are supplied with one-piece reflectors, with two- or four-piece reflectors split through the center and bolted together at the site, or completely disassembled (GRIDPAK™ antennas only). Reflector options are dependent on antenna size and type. Refer to the table in the next column.

Standard Pack. 2 ft. (0.6 m) antennas and 2 ft. radomes are shipped in cartons. Larger size antennas are shipped as one unit whenever possible. GRIDPAK™ antennas and mounts are shipped in one carton. Antennas and mounts are packed together whenever possible. 4-12 ft. (1.2-3.7 m) radomes are shipped in wood crates.

Export Pack. Packing is suitable for ocean, container or air shipment.

Standard and Optional Reflectors

Antenna Dia. ft (m)	Reflector Type	Standard or Optional
Solid Antennas		
2-6 (0.6-1.8)	One-Piece	Standard
8 (2.4)	One-Piece	Standard
8 (2.4)	Two-Piece	Optional*
10 (3.0)	One-Piece	Standard
10 (3.0)	Two-Piece	Optional*
12 (3.7)	One-Piece	Optional*
12 (3.7)	Two-Piece	Standard*
15 (4.6)	Two-Piece	Standard
15 (4.6)	Four-Piece	Optional
Grid Antennas		
4 (1.2)	One-Piece	Standard
6 (1.8)	One-Piece	Standard
8-15 (2.4-4.6)	Two-Piece	Standard
GRIDPAK™ Antennas		
All	Knockdown	Standard

*The following antennas are available with one-piece reflector only.

UHX8-37H	UHX10-59J	UGX10R-59C	UHX8-107H	UHX10-127H	UMX12-B465
UHX10-37H	UHX12-59J	UHX12-65J	UHX10-107H	UMX10-459B	UMX10-611A
UHX8-59H	UHX10X-59C	UHX10X-65	UGX10R-107E	UMX12-459A	HPX12-6511C
UHX10-59H	UHX12X-59C	UHX12X-65	UHX8-127H	UMX12-A465	

Horn-Reflector Antennas. The SHX® super high performance antenna is shipped on a returnable steel skid, Type **96000.** A deposit is required, which will be refunded upon return to the point of shipment. Two SHX antennas can be shipped on a 42-ft. long lowboy trailer or three SHX antennas on a 45-ft. trailer. Antenna support rings, hardware kits, mounts, side struts (if furnished) and other antenna accessories are shipped as separate pieces.

SHX Super High Performance Antennas

Description	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack				
Antenna Only	1342 (609)	1900 (860)	285x96x129 (7240x2440x3280)	2043 (60.0)
Platform Mount	505 (229)	600 (272)	Shipped as separate pieces	—
Tower Mount	1170 (531)	1270 (576)	Shipped as separate pieces	—
Export Pack				
Contact your local Andrew Sales Office.				

UHX®, UGX®, UMX® and HP Antennas

Description	Diameter Feet (m)	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	2 (0.6) (one-piece)	90 (41)	180 (82)	20x36x38 (508x915x965)	16 (0.5)
	4 (1.2) (one-piece)	170 (77)	340 (154)	55x37x57 (1400x940x1450)	67 (1.9)
	6 (1.8) (one-piece)	301 (137)	750 (340)	82x33x85 (2085x840x2160)	135 (3.8)
	8 (2.4) (one-piece)	447 (203)	1100 (499)	108x41x107 (2745x1040x2720)	275 (7.8)
	8 (2.4) (two-piece)	460 (209)	1000 (454)	108x48x63 (2745x1220x1600)	189 (5.4)
	10 (3.0) (one-piece)*	541 (245)	1400 (636)	129x42x130 (3275x1070x3305)	408 (11.6)
	10 (3.0) (two-piece)	560 (254)	1440 (653)	142x78x48 (3610x1985x1220)	308 (8.8)
	12 (3.7) (one-piece)*	850 (386)	2000 (910)	156x95x128 (3965x2415x3550)	1098 (34.0)
	12 (3.7) (two-piece)	860 (390)	1800 (817)	157x60x84 (3990x1525x2135)	458 (13.0)
	15 (4.6) (two-piece)†	1780 (807)	3000 (1361)	194x48x101 (4930x1375x2565)	545 (15.4)
Export Pack	2 (0.6) (one-piece)	90 (41)	180 (82)	20x36x38 (508x915x965)	16 (0.5)
	4 (1.2) (one-piece)	170 (77)	450 (204)	56x31x58 (1420x785x1475)	58 (1.6)
	6 (1.8) (one-piece)	301 (137)	820 (372)	82x33x85 (2085x840x2160)	135 (3.8)
	8 (2.4) (one-piece)	447 (203)	1325 (601)	108x41x107 (2745x1040x2720)	275 (7.8)
	8 (2.4) (two-piece)	460 (209)	1100 (499)	108x48x63 (2745x1220x1600)	189 (5.4)
	10 (3.0) (one-piece)	541 (245)	1700 (771)	130x43x130 (3305x1095x3305)	420 (12.0)
	10 (3.0) (two-piece)	560 (254)	1600 (726)	142x78x48 (3610x1985x1220)	310 (8.8)
	12 (3.7) (one-piece)	850 (386)	2850 (1680)	155x57x154 (3935x1450x3910)	790 (22.4)
	12 (3.7) (two-piece)	860 (390)	2200 (998)	157x60x84 (3990x1525x2135)	458 (13.0)
	15 (4.6) (two-piece)†	1780 (807)	3600 (1633)	194x48x101 (4930x1375x2565)	545 (15.4)

Except where noted otherwise, weights and dimensions include reflector, shield, planar radome, feed and vertical tower mount.
†Contact your local Andrew Sales Office for information on four-piece reflectors.
*Feed for UMX ( )-459 series packs in a separate crate 37x30x58 in., 55 lb. net, 175 lb. gross (940x765x1475 mm, 25 kg net, 80 kg gross.)

Standard Antennas

Description	Diameter Feet (m)	Net Weight* Pounds (kg)	Gross Weight* Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	2 (0.6)	14 (7)	20 (9)	31x31x15 (790x790x380)	9 (0.3)
	4 (1.2)	104 (47)	145 (66)	53x11x54 (1345x280x1370)	19 (0.5)
	6 (1.8)	134 (61)	210 (95)	76x16x77 (1930x405x1960)	55 (1.6)
	8 (2.4) (one-piece)	251 (114)	470 (213)	103x20x102 (2620x510x2595)	120 (3.4)
	8 (2.4) (two-piece)	264 (120)	770 (349)	108x35x63 (2745x890x1600)	138 (3.9)
	10 (3.0) (one-piece)	317 (144)	895 (406)	126x87x98 (3205x2210x2490)	622 (17.7)
	10 (3.0) (two-piece)	336 (152)	1220 (553)	133x71x48 (3380x1805x1220)	262 (7.4)
	12 (3.7) (one-piece)	540 (245)	1700 (771)	154x37x153 (3910x940x3885)	505 (14.3)
	12 (3.7) (two-piece)	600 (272)	1300 (590)	157x42x84 (3990x1070x2135)	321 (9.2)
	15 (4.6) (two-piece)	1240 (562)	2400 (1089)	194x48x101 (4930x1220x2565)	545 (15.4)
Export Pack	2 (0.6)	14 (7)	70 (32)	32x33x14 (815x840x355)	9 (0.3)
	4 (1.2)	104 (47)	380 (172)	68x13x57 (1725x330x1450)	30 (0.8)
	6 (1.8)	134 (61)	530 (240)	91x20x80 (2310x410x2030)	85 (2.4)
	8 (2.4) (one-piece)	251 (114)	820 (372)	117x26x107 (2970x660x2720)	188 (5.4)
	8 (2.4) (two-piece)	264 (120)	870 (395)	108x35x63 (2745x890x1600)	138 (3.9)
	10 (3.0) (one-piece)	317 (144)	1170 (531)	126x35x130 (3200x890x3300)	332 (9.4)
	10 (3.0) (two-piece)	336 (152)	1320 (599)	133x71x48 (3380x1805x1220)	262 (7.4)
	12 (3.7) (one-piece)	540 (245)	2200 (998)	154x37x153 (3910x840x3885)	505 (14.3)
	12 (3.7) (two-piece)	600 (272)	1600 (726)	157x42x84 (3990x1070x2135)	321 (9.2)
	15 (4.6) (two-piece)	1240 (562)	2800 (1270)	194x48x101 (4930x1220x2565)	545 (15.4)

*Includes mount

Antenna Mounts

Description	Type No.	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches	(mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	T6SB**	68 (31)	70 (32)	31x12x4	(790x305x105)	1 (0.03)
	M10	20 (9)	23 (11)	14x 9x7	(355x230x180)	1 (0.03)
	T10SB**	114 (52)	120 (55)	124x48x12	(3150x1220x305)	41 (1.2)
	T12SA**	190 (86)	200 (91)	124x48x12	(3150x1220x305)	41 (1.2)
	VT6B	66 (30)	70 (32)	31x12x4	(790x305x100)	1 (0.03)
	HT6	87 (39)	150 (68)	36x36x12	(915x915x305)	9 (0.26)
	VT10	156 (71)	170 (77)	124x48x12	(3150x1220x305)	41 (1.2)
	HT10	98 (44)	175 (79)	48x48x12	(1220x1220x305)	16 (0.46)
Export Pack	T6SB**	68 (31)	90 (41)	34x14x7	(865x360x180)	2 (0.06)
	M10	20 (9)	60 (27)	17x11x9	(430x280x230)	1 (0.03)
	T10SB**	114 (52)	*		*	*
	T12SA**	190 (86)	*		*	*
	VT6B	66 (30)	120 (54)	34x14x6	(860x355x150)	2 (0.06)
	HT6	87 (39)	150 (68)	39x38x15	(995x970x385)	13 (0.36)
	VT10	156 (71)	*		*	*
	HT10	98 (44)	*		*	*

*Mounts for 8, 10 and 12-ft. antennas are shipped inside the antenna crate for export pack. Add the net weight shown for standard pack to obtain total weight.

**Antenna includes standard T series mount. Do not add mount weight to determine antenna weight.

Molded Radomes for Standard Antennas

Description	Diameter Feet (m)	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches	(mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	2 (0.6)	3 (2)	9 (4)	29x29x17	(740x740x440)	9 (0.3)
	4 (1.2)	15 (7)	60 (27)	52x28x52	(1320x715x1320)	44 (1.2)
	6 (1.8)	28 (13)	153 (70)	79x35x79	(2010x890x2010)	126 (3.6)
	8 (2.4)	53 (24)	203 (92)	103x44x103	(2620x1120x2620)	270 (7.7)
	10 (3.0)	85 (39)	550 (249)	129x90x100	(3275x2290x2540)	672 (19.0)
	12 (3.7)	114 (52)	725 (329)	156x95x128	(3965x2415x3255)	1100 (31.2)
Export Pack	2 (0.6)	3 (2)	70 (32)	32x30x19	(820x770x490)	11 (0.3)
	4 (1.2)	15 (7)	240 (109)	52x53x28	(1320x1350x710)	45 (1.3)
	6 (1.8)	28 (13)	300 (136)	78x33x79	(1980x840x2010)	118 (3.3)
	8 (2.4)	53 (24)	500 (227)	103x43x103	(2620x1095x2620)	264 (7.6)
	10 (3.0)	85 (39)	820 (372)	129x90x100	(3275x2290x2540)	672 (19.0)
	12 (3.7)	114 (52)	1200 (544)	157x96x128	(3965x2440x3255)	1117 (31.5)

Grid Antennas

Description	Diameter Feet (m)	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches	(mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	4 (1.2)	75 (34)	92 (42)	56x14x54	(1425x355x1370)	25 (0.7)
	6 (1.8)	109 (49)	175 (79)	77x20x78	(1955x510x1980)	70 (2.0)
	8 (2.4)	225 (102)	457 (207)	107x33x63	(2720x840x1600)	120 (3.5)
	10 (3.0)	265 (120)	630 (286)	134x43x75	(3405x1090x1905)	253 (7.2)
	12 (3.7)	405 (184)	1250 (567)	162x48x88	(4115x1220x2235)	441 (12.5)
	15 (4.6)	645 (293)	1750 (794)	198x55x102	(5030x1400x2590)	765 (21.7)
Export Pack	4 (1.2)	75 (34)	275 (125)	72x16x57	(1830x405x1450)	38 (1.1)
	6 (1.8)	185 (84)	350 (159)	93x18x82	(2360x455x2080)	77 (2.2)
	8 (2.4)	225 (102)	650 (295)	108x33x63	(2745x840x1600)	122 (3.5)
	10 (3.0)	265 (120)	1050 (477)	134x44x75	(3405x1120x1905)	259 (7.4)
	12 (3.7)	405 (184)	1500 (680)	163x49x88	(4140x1245x2235)	452 (12.8)
	15 (4.6)	645 (293)	2200 (998)	199x56x102	(5055x1420x2590)	781 (22.2)

Weights and dimensions include reflector, feed and vertical tower mount.

GRIDPAK™ Antennas

Description	Type Number	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
Standard/ Export Pack	KP4-15, -17, -19, -23, -25	51 (23)	71 (32)	55x18x6 (1380x460x155)	4 (0.1)
	KP6-335, KP6-365, KP6-403	88 (40)	225 (102)	94x27x11 (2380x685x290)	17 (0.47)
	KP6-820	93 (42)	229 (104)	94x27x11 (2380x685x290)	17 (0.47)
	KP6-15, -17, -19, -23, -25	199 (90)	327 (148)	96x31x18 (2440x770x450)	31 (0.85)
	KP8-15, -17, -19, -23, -25	234 (106)	410 (186)	107x42x20 (2700x1060x500)	52 (1.43)
	(KP8 container 2)	71 (32)	113 (51)	123x 7 x9 (3110x160x220)	5 (0.11)
	KP10-335, KP10-365, KP10-403	150 (68)	351 (159)	129x35x11 (3275x890x290)	30 (0.85)
	KP10-820	159 (72)	359 (163)	129x35x11 (3275x890x290)	30 (0.85)
	KP10-15, -17, -19, -23, -25	419 (190)	673 (305)	137x44x22 (3470x1120x560)	77 (2.18)
	KP13-335, KP13-365, KP13-403	196 (89)	564 (256)	173x39x12 (4400x990x310)	48 (1.35)
	KP13-820	212 (96)	580 (263)	173x39x12 (4400x990x310)	48 (1.35)
	KP13-15, -17, -19, -23, -25	518 (235)	805 (365)	173x44x22 (4380x1120x560)	97 (2.60)

Note: Add 4 inches (100 mm) to "H" dimension for each set of stacked antennas for fork lift skid.
Weights and dimensions include reflector, feed and vertical tower mount.

Mini GRIDPAK™ Antennas

Description	Type Number	Net Weight Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
Standard Pack	MKP-335	29 (13)	42 (19)	99x20x6 (2510x500x140)	6.9 (0.175)
	MKP-403	29 (13)	42 (19)	99x20x6 (2510x500x140)	6.9 (0.175)
	MKP-820	35 (16)	53 (24)	99x20x6 (2510x500x140)	6.9 (0.175)
Export Pack	MKP-335	29 (13)	91 (42)	102x26x11 (2600x650x280)	16.9 (0.47)
	MKP-403	29 (13)	91 (42)	102x26x11 (2600x650x280)	16.9 (0.47)
	MKP-820	35 (16)	102 (47)	102x26x11 (2600x650x280)	16.9 (0.47)

Weights and dimensions include reflector, feed and vertical tower mount.

Rigid Transmission Lines

Line Size	Section Length, ft	No. of Sections Per Crate	Net Weight Per Section Pounds (kg)	Gross Weight Pounds (kg)	Dimensions LxWxH Inches (mm)	Volume Cubic Feet (Cubic Metres)
1-5/8"	20	12	27 (12.3)	530 (241)	250x24x14 (6350x610x360)	48.6 (1.4)
3-1/8"	20	6	52 (23.6)	550 (250)	250x24x22 (6350x610x560)	76.4 (2.2)
4-1/16"	20	3	115 (52.3)	330 (150)	250x24x10 (6350x610x255)	35.4 (1.0)
6-1/8"	20	2	129 (58.6)	270 (122)	250x19x10 (6350x490x255)	27.5 (.08)

HELIAX® Coaxial Cables and Waveguides

General. HELIAX coaxial cables and elliptical waveguides are shipped in cartons, wooden crates, or on reels. For domestic shipments within Canada, the smaller size reels are disposable and the larger size reels are returnable and require a deposit. For international shipments, specially constructed reels are normally sold as an item of export packing.

Ocean or Other Special Transport. Contact your local Andrew Sales Office.

The tables show the lengths of cable with or without connectors, shipped in cartons, crates, disposable reels and returnable, deposit-type reels.

1/4″, 3/8″ and 1/2″ HELIAX® Coaxial Cables — English Units

			Carton, Qty, ft			Disposable Reel, Qty, ft	
Cable Size	Type Number	Weight lb/ft	31x31x 3 in	45.5x45.5x 6 in	46x46x 7 in	48 in Dia. by 24 in Width	48 in Dia. by 24 in Width
1/4″	FHJ1-5	0.07	5-750	750-1500	—	1500-8000	8000-18000
1/4″	FSJ1-50	0.06	5-750	750-1500	—	1500-8000	8000-18000
1/4″	FSJ1-75	0.06	5-750	750-1500	—	1500-8000	8000-18000
3/8″	LDF2-50	0.08	5-300	300-700	—	700-3000	3000-7800
1/2″	FSJ4-50B	0.16	5-250	250-575	—	575-2100	2100-6000
1/2″	FSJ4-75A	0.16	5-250	250-575	—	575-2100	2100-6000
1/2″	HT4-50	0.22	5-250	250-575	—	575-2600	2600-6000
1/2″	LDF4-50A	0.16	5-175	175-500	500-520	520-1400	1400-3900
1/2″	LDF4-75A	0.14	5-175	175-500	500-520	520-1400	1400-3900
1/2″	LDF4P-50A	0.16	5-175	175-500	500-520	520-1400	1400-3900
1/2″	HJ4-50	0.24	5-175	175-400	400-520	520-1500	1500-4700
1/2″	RX4	0.16	5-175	175-500	500-520	520-1400	1400-3900
Tare Weight, lb			5	15	15	94	110

7/8″ HELIAX® Coaxial Cables — English Units

			Carton, Qty, ft			Disposable Reel, Qty, ft				Returnable Reel Qty, ft Type 25190-28
Cable Size	Type Number	Weight lb/ft	40x40x 4 in	45.5x45.5x 6 in	46x46x 7 in	48 in Dia. by 24 in Width	60 in Dia. by 21 in Width	72 in Dia. by 30 in Width	80 in Dia. by 30 in Width	85 in Dia. by 47 in Width
7/8″	FHJ5-75	0.44	5-17	17-150	150-225	225-400	400-800	800-1800	1800-2600	2600-7200
7/8″	HJ5-50	0.54	5-17	17-150	150-225	—	225-800	800-1800	1800-2600	2600-7200
7/8″	HJ5-75	0.54	5-17	17-150	150-225	—	225-800	800-1800	1800-2600	2600-7200
7/8″	HJ5P-50	0.54	5-17	17-150	150-225	—	225-800	800-1800	1800-2600	2600-7200
7/8″	HT5-50	0.47	5-17	17-150	150-225	—	225-800	800-1800	1800-2600	2600-7200
7/8″	LDF5-50A	0.33	5-17	17-150	150-225	225-400	400-800	800-1800	1800-2600	2600-7200
7/8″	LDF5P-50A	0.33	5-17	17-150	150-225	225-400	400-800	800-1800	1800-2600	2600-7200
7/8″	RX5	0.44	5-17	17-150	150-225	225-400	400-800	800-1800	1800-2600	2600-7200
Tare Weight, lb			7	15	15	94	105	388	515	1630

1-1/4″, 1-5/8″ and 3″ HELIAX® Coaxial Cables — English Units

			Wood Box Qty, ft	Crate Qty, ft	Disposable Reel, Qty, ft		Returnable Reel, Qty, ft Type 25190-25	Type 25190-14	Type 25190-5	Type 25190-37
Cable Size	Type Number	Weight lb/ft	6x6x 240 in	82x82x 16 in	72 in Dia. by 30 in Width	80 in Dia. by 30 in Width	86 in Dia. by 51 in Width	93 in Dia. by 40 in Width	98 in Dia. by 66 in Width	100 in Dia. by 70 in Width
1-1/4″	LDF6-50	0.66	6-17	17-300	300-850	850-1300	1300-3000	—	3000-4000	4000-5000
1-1/4″	LDF6P-50	0.66	6-17	17-300	300-850	850-1300	1300-3000	—	3000-4000	4000-5000
1-5/8″	HJ7-50A	1.04	6-17	17-200	200-350	350-850	850-1600	—	1600-2200	2200-2700
1-5/8″	HJ7P-50A	1.04	6-17	17-200	200-350	350-850	850-1600	—	1600-2200	2200-2700
1-5/8″	HJ7P-75A	1.04	6-17	17-200	200-350	350-850	850-1600	—	1600-2200	2200-2700
1-5/8″	LDF7-50A	0.92	6-17	17-200	200-350	350-850	850-1600	—	1600-2200	2200-2700
1-5/8″	LDF7P-50A	0.92	6-17	17-200	200-350	350-850	850-1600	—	1600-2200	2200-2700
3″	HJ8-50B	1.78	to 19	19-200†	—	—	—	200-250	250-850	850-1000
Tare Weight, lb			120	160	388	515	1600	1750	2100	2800

†Uses crate 94x94x18 in; Tare Weight 200 lb

4″ and 5″ HELIAX® Coaxial Cables — English Units

			Wood Box Qty, ft	Crate Qty, ft			Returnable Reel, Qty, ft Type 25190-26	Type 25190-39	Type 25190-38
Cable Size	Type Number	Weight lb/ft	9x9x 240 in	103x103x 34 in	110x110x 34 in	129x129x 34 in	110 in Dia. by 70 in Width	129 in Dia. by 74 in Width	146 in Dia. by 81 in Width
4″	HJ11-50	2.50	to 19	19-145	145-200	—	200-600	*	800-2000
5″	HJ9-50	3.30	to 19	—	—	19-135	—	135-525	525-1100
Tare Weight, lb			120	500	530	850	2800	3600	4500

*Lengths 600-800 ft ship on 25190-9 reel.

1/4″, 3/8″ and 1/2″ HELIAX® Coaxial Cables — Metric Units

			Carton, Qty, m			Disposable Reel, Qty, m	
Cable Size	Type Number	Weight kg/m	790x790x 80 mm	1160x1160x 150 mm	1170x1170x 180 mm	1220 mm Dia. 610 mm Width	1220 mm Dia. 610 mm Width
1/4″	FHJ1-5	0.10	2-225	225-455	—	455-2435	2435-5485
1/4″	FSJ1-50	0.09	2-225	225-455	—	455-2435	2435-5485
1/4″	FSJ1-75	0.09	2-225	225-455	—	455-2435	2435-5485
3/8″	LDF2-50	0.12	2-90	90-210	—	210-910	910-2375
1/2″	FSJ4-50B	0.24	2-75	75-175	—	175-640	640-1825
1/2″	FSJ4-75A	0.24	2-75	75-175	—	175-640	640-1825
1/2″	HJ4-50	0.36	2-50	50-120	120-155	155-455	455-1430
1/2″	HT4-50	0.33	2-75	75-175	—	175-790	790-1825
1/2″	LDF4-50A	0.24	2-50	50-150	150-155	155-425	425-1185
1/2″	LDF4-75A	0.21	2-50	50-150	150-155	155-425	425-1185
1/2″	LDF4P-50A	0.24	2-50	50-150	150-155	155-425	425-1185
1/2″	RX4	0.24	2-50	50-150	150-155	155-425	425-1185
Tare Weight, kg			2	7	15	43	50

7/8″ HELIAX® Coaxial Cables — Metric Units

			Carton, Qty, m			Disposable Reel, Qty, m				Returnable Reel Qty, m Type 25190-28
Cable Size	Type Number	Weight kg/m	1016x1016x 102 mm	1160x1160x 150 mm	1170x1170x 180 mm	1220 mm Dia. 610 mm Width	1524 mm Dia. 533 mm Width	1830 mm Dia. 760 mm Width	2032 mm Dia. 762 mm Width	2160 mm Dia. 1190 mm Width
7/8″	FHJ5-75		2-5	5-45	45-65	65-120	120-240	240-545	545-790	790-2190
7/8″	HJ5-50	0.80	2-5	5-45	45-65	—	65-240	240-545	545-790	790-2190
7/8″	HJ5-75	0.80	2-5	5-45	45-65	—	65-240	240-545	545-790	790-2190
7/8″	HJ5P-50	0.80	2-5	5-45	45-65	—	65-240	240-545	545-790	790-2190
7/8″	HT5-50	0.70	2-5	5-45	45-65	—	65-240	240-545	545-790	790-2190
7/8″	LDF5-50A	0.49	2-5	5-45	45-65	65-120	120-240	240-545	545-790	790-2190
7/8″	LDF5P-50A	0.49	2-5	5-45	45-65	65-120	120-240	240-545	545-790	790-2190
7/8″	RX5	0.65	2-5	5-45	45-65	65-120	120-240	240-545	545-790	790-2190
Tare Weight, kg			3	7	7	43	48	176	234	739

1-1/4″, 1-5/8″ and 3″ HELIAX® Coaxial Cables — Metric Units

			Wood Box Qty, m	Crate Qty, m	Disposable Reel, Qty, m		Returnable Reel, Qty, m Type 25190-25	Type 25190-14	Type 25190-5	Type 25190-37
Cable Size	Type Number	Weight kg/m	150x150x 6100 mm	2082 mm Dia. 410 mm	1829 mm Dia. 762 mm Width	2032 mm Dia. 762 mm Width	2180 mm Dia. 1295 mm Width	2360 mm Dia. 1020 mm Width	2490 mm Dia. 1680 mm Width	2800 mm Dia. 1780 mm Width
1-1/4″	LDF6-50	0.98	2-5	5-90	90-255	255-395	395-910	—	910-1215	1215-1520
1-1/4″	LDF6P-50	0.98	2-5	5-90	90-255	255-395	395-910	—	910-1215	1215-1520
1-5/8″	HJ7-50A	1.55	2-5	5-60	60-105	105-255	255-485	—	485-670	670-820
1-5/8″	HJ7P-50A	1.55	2-5	5-60	60-105	105-255	255-485	—	485-670	670-820
1-5/8″	HJ7P-75A	1.55	2-5	5-60	60-105	105-255	255-485	—	485-670	670-820
1-5/8″	LDF7-50A	1.37	2-5	5-60	60-105	105-255	255-485	—	485-670	670-820
1-5/8″	LDF7P-50A	1.37	2-5	5-60	60-105	105-255	255-485	—	485-670	670-820
3″	HJ8-50B	2.65	to 6	6-60†	—	—	—	60-75	75-255	255-300
Tare Weight, kg			54	73	177	235	726	794	953	1270

†Uses crate 2388x2388x457, Tare Weight 136 kg

4″ and 5″ HELIAX® Coaxial Cables — Metric Units

Cable Size	Type Number	Weight kg/m	Wood Box Qty, m	Crate Qty, m			Returnable Reel, Qty, m Type 25190-37	Type 25190-39	Type 25190-38
			229x229x 6096 mm	2620x2620x 860 mm	2800x2800x 860 mm	3280x3280x 860 mm	2800 mm Dia. 1780 mm Width	3280 mm Dia. 1880 mm Width	3710 mm Dia. 2060 mm Width
4″	HJ11-50	3.72	to 6	6-40	40-60	—	60-780	*	240-605
5″	HJ9-50	4.91	to 6	—	—	6-40	—	40-160	160-335
Tare Weight, kg			54	227	240	386	1270	1633	2041

*Lengths 180-240 m ship on 25190-9 reel.

These tables show the lengths of waveguide with or without connectors, shipped in cartons, wooden crates or disposable reels. Shorter lengths than shown are shipped straight in wooden boxes. Longer lengths than shown are shipped on returnable deposit-type reels.

HELIAX® Elliptical Waveguide — English Units

Type Number	Weight lb/ft	Carton or Wood Crate Length ft	Dimensions in	Tare Wt. lb	Disposable Reel, Qty, ft 48 in Dia. by 24 in Width	60 in Dia. by 21 in Width	72 in Dia. by 30 in Width	80 in Dia. by 30 in Width
EW17	2.73	20-75	83x83x15	150	—	—	—	—
EWP17	2.73	20-135	125x125x34	600	—	—	—	—
EW20	1.85	20-75	83x83x15	150	—	—	—	—
EW28	1.37	20-100	83x83x15	150	—	—	—	—
EW34	1.13	20-150	83x83x15	150	—	—	—	150-220
EWP34	1.13	—	—	—	—	—	—	20-220
EW37	0.84	20-150	83x83x15	150	—	—	—	150-240
EWP37, EWP37S	0.84	—	—	—	—	—	—	20-240
EW44	0.64	18-200	68x68x14	110	—	—	200-450	450-800
EWP44	0.64	—	—	—	—	—	—	20-350
EWS44	0.70	—	—	—	—	—	50-425	425-800
EW52	0.59	18-225	68x68x14	110	—	—	225-500	500-1000
EWP52, EWP52S	0.59	—	—	—	—	20-50	50-500	500-1000
EW63	0.51	18-225	64x64x14	100	—	—	225-700	700-1300
EWP63, EWP63S	0.51	—	—	—	—	20-70	70-700	700-1300
EW64	0.49	18-225	64x64x14	100	—	—	225-1000	1000-1400
EWP64	0.49	—	—	—	—	20-80	80-1000	1000-1400
EW77	0.45	5-150	46x46x7	15	—	150-400	400-1000	1000-1700
EWP77	0.45	—	—	—	18-75	75-400	400-1000	1000-1700
EW85	0.33	5-200	45.5x45.5x6	15	—	200-700	700-1700	1700-2800
EW90	0.32	5-200	45.5x45.5x6	15	—	200-850	850-1900	1900-3400
EWP90, EWP90S	0.32	—	—	—	18-125	125-850	850-1900	1900-3400
EW127	0.29	5-200	45.5x45.5x6	15	200-750	750-1100	1100-2800	2800-4500
EWP127	0.29	—	—	—	18-750	750-1100	1100-2800	2800-4500
EW132	0.22	5-200	45.5x45.5x6	15	200-1000	1000-1600	1600-3700	3700-6000
EWP132	0.22	—	—	—	18-1000	1000-1600	1600-3700	3700-6000
EW180	0.15	0-200	45.5x45.5x6	15	200-1600	1600-2300	2300-5500	5500-8000
EWP180	0.15	—	—	—	18-1600	1600-2300	2300-5500	5500-8000
EW220	0.12	5-500	45.5x45.5x6	15	500-2000	2000-3200	3200-7500	7500-12000
EWP220	0.12	—	—	—	18-2000	2000-3200	3200-7500	7500-12000
Tare Weight, lb					94	105	388	520

HELIAX® Elliptical Waveguide — Metric Units

Type Number	Weight kg/m	Carton or Wood Crate Length m	Carton or Wood Crate Dimensions mm	Carton or Wood Crate Tare Wt. kg	Disposable Reel, Qty, m 1220 mm Dia. 610 mm Width	Disposable Reel, Qty, m 1524 mm Dia. 533 mm Width	Disposable Reel, Qty, m 1830 mm Dia. 760 mm Width	Disposable Reel, Qty, m 2030 mm Dia. 760 mm Width
EW17	4.06	6-23	2110x2110x380	68	—	—	—	—
EWP17	4.06	6-41	3175x3175x860	272	—	—	—	—
EW20	2.76	6-23	2110x2110x380	68	—	—	—	—
EW28	2.04	6-30	2110x2110x380	68	—	—	—	—
EW34	1.68	6-46	2110x2110x380	68	—	—	—	45-65
EWP34	1.68	—	—	—	—	—	—	5-65
EW37	1.25	6-45	2110x2110x380	68	—	—	—	45-70
EWP37, EWP37S	1.25	—	—	—	—	—	—	5-70
EW44	0.96	5-60	1730x1730x360	50	—	—	60-135	135-240
EWP44	0.96	—	—	—	—	—	—	5-105
EWS44	1.04	—	—	—	—	—	15-130	130-240
EW52	0.88	5-65	1730x1730x360	50	—	—	65-150	150-305
EWP52, EWP52S	0.88	—	—	—	—	6-15	15-150	150-305
EW63	0.76	5-65	1630x1630x360	45	—	—	65-210	210-395
EWP63, EWP63S	0.76	—	—	—	—	6-20	20-210	210-395
EW64	0.73	5-65	1630x1630x360	45	—	—	65-305	305-425
EWP64	0.73	—	—	—	—	6-20	20-305	305-425
EW77	0.67	1.5-45	1170x1170x180	7	—	45-120	120-305	305-515
EWP77	0.67	—	—	—	5-20	20-120	120-305	305-515
EW85	0.49	1.5-60	1160x1160x150	7	—	60-210	210-515	515-850
EW90	0.48	1.5-60	1160x1160x150	7	—	60-255	255-575	575-1035
EWP90, EWP90S	0.48	—	—	—	5-35	35-255	255-575	575-1035
EW127	0.43	1.5-60	1160x1160x150	7	60-225	225-335	335-850	850-1370
EWP127	0.43	—	—	—	5-225	225-335	335-850	850-1370
EW132	0.33	1.5-60	1160x1160x150	7	60-305	305-485	485-1125	1125-1825
EWP132	0.33	—	—	—	5-305	305-485	485-1125	1125-1825
EW180	0.22	0-60	1160x1160x150	7	60-485	485-700	700-1675	1675-2435
EWP180	0.22	—	—	—	5-485	485-700	700-1675	1675-2435
EW220	0.18	1.5-150	1160x1160x150	7	150-610	610-975	975-2285	2285-3655
EWP220	0.18	—	—	—	5-610	610-975	975-2285	2285-3655
Tare Weight, kg					43	48	176	236

Shipping Information

Conditions of Sale

1. Prices. Prices are subject to change without notice. Firm quotations are available for specific time periods, upon request. Prices as listed are F.O.B. Orland Park, Illinois where noted [O]; Denton, Texas where noted [D]; Richardson, Texas where noted [R]; Campbellfield, Victoria, Australia where noted [A]; Lochgelly, Fife, Great Britain where noted [B]; or Whitby, Ontario, Canada where noted [C]; freight collect, and do not include export packing, insurance, taxes, tariffs, or duties. For international shipments, quotations may be obtained F.O.B. plant, F.A.S. port of departure, or C.I.F. port of entry.

2. Taxes. The prices do not include amounts for retailers' occupation, sales, use, gross income, privilege or excise tax or any other tax, duty or assessment which may arise from the sale of the equipment, and such amounts may be added to the price in the event Seller becomes liable to pay or bear the burden thereof. A request for exemption from any such tax, duty or assessment must be accompanied by a properly executed exemption certificate.

3. Shipment. Unless otherwise specified in an order, shipments are made F.O.B. shipping point, freight collect, and Buyer shall pay or bear all transportation charges and bear the risk of loss or damage to equipment from the time it is delivered to a carrier. When shipments are F.O.B. destination, Seller will deliver the equipment to a carrier for transportation to Buyer, arrange for transportation thereof to destination, and pay transportation charges therefor, but Buyer assumes the risk of loss or damage to equipment from the time the equipment is deposited with a carrier and shall pay all charges at destination for cartage, storage, other accessorial services and demurrage. Seller may make partial shipments and submit for such partial shipments invoices payable in accordance with Seller's terms below.

4. Terms. All shipments are made C.O.D. unless otherwise specified herein. When the terms are specified as "open account", shipments are payable within thirty (30) days of invoice date. Accounts past due are subject to a ½% monthly charge on the unpaid balance. Buyer is responsible for all reasonable attorney fees, court costs, and/or collection agency fees should such action become necessary by reasons of Buyer's fault.

5. Returnable Shipping Reels and Skids. Where a deposit has been charged Buyer, a credit for return of the reel or skid will be issued to Buyer if the reel or skid is returned F.O.B. Seller's factory within one year from the date of original shipment in good condition, reasonable wear and tear excepted.

6. Delays. In the event of any delay in delivery due directly or indirectly to priorities requested by the Government or granted for the Government's benefit, or Acts of God, acts of the public enemy, acts of the United States, any State, Territory of the United States or any political subdivision of the foregoing, or the District of Columbia, acts of Buyer, its employees, agents, or subcontractors, fires, floods, strikes, freight embargoes, unusually severe weather conditions, inadequate transportation facilities, or any cause whatsoever beyond the control and without the fault of negligence of Seller or its subcontractors, whether similar to or dissimilar from the causes herein enumerated, then Seller shall have an extension of time within which to perform hereunder as may be necessary.

7. Acceptance. Buyer's retention or possession of the equipment for a period in excess of 30 days, or Buyer's express acceptance prior to the expiration of such time period, shall constitute an irrevocable acceptance and, except as provided in Seller's WARRANTY below, a waiver by Buyer of all claims that the equipment does not conform to this order.

8. Warranty. All the equipment of Seller carries a warranty that it is transferred rightfully and with good title; that it is free from any lawful security interest or other lien or encumbrance unknown to Buyer, and that for a period of one year from the date of installation or fifteen months from the date of original shipment, whichever period expires first, such equipment will be free from defects in material and workmanship which arise under proper and normal use and service, provided however, Buyer's exclusive remedy is limited to Seller's correction (either at its plant or at such other place as may be agreed upon between Seller and Buyer) or any such defects by repair or replacement at no increase in the price, provided further, however, the cost of any transportation in connection with the return of the equipment by reason of defects for the purpose of repair or replacement shall be borne by Buyer. The provisions of this warranty shall be applicable with respect to any equipment which Seller repairs or replaces pursuant to it. SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, OTHER THAN AS IS EXPRESSLY PROVIDED ABOVE, THERE BEING NO OTHER WARRANTIES WHICH EXTEND BEYOND THE WRITTEN DESCRIPTION OF THE EQUIPMENT, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS. THE FOREGOING SHALL CONSTITUTE ALL OF SELLER'S LIABILITY (EXCEPT AS TO PATENT INFRINGEMENT) WITH RESPECT TO THE EQUIPMENT. IN NO EVENT SHALL SELLER BE LIABLE FOR CONSEQUENTIAL DAMAGES, INSTALLATION COST, OR OTHER COSTS OF ANY NATURE AS A RESULT OF THE USE OF THE PRODUCTS MANUFACTURED BY THE SELLER, WHETHER USED IN ACCORDANCE WITH INSTRUCTIONS OR NOT. NO REPRESENTATIVE IS AUTHORIZED TO ASSUME FOR THE SELLER ANY OTHER LIABILITY IN CONNECTION WITH THE SELLER'S PRODUCTS.

9. Patent Infringement Assurance. Seller shall, at its own expense, settle or defend any claim, suit or action which may be brought against Buyer for infringement of United States patents arising out of Buyer's use of Seller's equipment furnished under this order, and Seller shall pay any final judgment for damages and costs which may be awarded against Buyer, upon the condition that Buyer shall have given Seller prompt notice of any such claim, suit or action, together with affording Seller complete control of the conduct of such settlement or defense, and all available information and reasonable cooperation shall have been furnished Seller by Buyer at Seller's written request, but at its expense. Seller may, at its own expense, elect to either procure for Buyer the right to continue using the equipment claimed to infringe, or replace it with non-infringing equipment, or modify it so that it becomes non-infringing, or remove it and repay the purchase price applicable thereto, as well as transportation costs. This paragraph shall not apply to infringement arising out of features of construction incorporated in the equipment at the request of Buyer or out of use of the equipment for purposes and uses other than as advertised or sold by Seller. The foregoing states Seller's entire liability for patent infringement by the equipment or any part of it.

10. Confidential Information. Unless otherwise specified in the schedule of this order, title to all drawings, specifications, reprints, technical designs, business plans or any other data furnished to Buyer by Seller in connection with the placing or performance of this order shall remain in Seller, including the right to have such data and all copies thereof returned to Seller upon request. All information contained in such data or embodied in any other property of Seller to which Seller retains title, and any use of, or manner of use of such data or other property by Seller, shown or communicated to Buyer in connection with the placing or performance of this order which is not known generally in the field of Seller or of Buyer shall be kept confidential by Buyer (except to any extent to which it is established to have been known previously to Buyer from sources other than Seller). Nothing in the schedule shall be interpreted or construed to require Seller to disclose any data containing information concerning the details of Seller's secrets of manufacture or other proprietary business interests.

11. Affiliated Subcontracts. An order, or any part of it, may be performed for and the rights thereunder may be enforced against Buyer by Seller's affiliated or associated corporations if subcontracted by Seller to any such affiliate or associate.

12. Fair Labor Standards Act. Seller hereby warrants that the equipment to be furnished or the services to be performed by it will be furnished or performed in accordance with the provisions of the Fair Labor Standards Act of 1938, as amended, including Sec. 6, 7 and 12 of the Act, and all valid and applicable regulations and orders of the Administrator of the Wage and Hour Division issued under Sec. 14 thereof.

13. Government Contracts. If Seller's performance under an order is done with knowledge that it is pursuant to a U.S. Government prime or subcontract, then any clause required to be included in this order by any applicable law or administrative order, rule or regulation having the effect of law, shall be deemed to be incorporated herein by this reference.

14. Place of Acceptance. An order is valid only when accepted in writing at Seller's office, 10500 W. 153rd Street, Orland Park, Illinois. The contract arising therefrom shall be deemed to have been entered into the State of Illinois, U.S.A., and its interpretation, construction, and the remedies for its enforcement or breach are to be applied in accordance with the laws of that state.

15. Specification Changes. All designs and specifications of Seller's products are subject to change without notice provided the changes do not materially affect performance.

16. Tools. Unless otherwise expressly provided, Seller shall retain title to and possession of all models, patterns, dies and tools.

17. Other Terms and Conditions. Additional terms and conditions per Andrew Bulletins 8721, 8722 and 8723 apply for projects involving delivery, tower erection, shelter placement, antenna/waveguide installation or other field services offered by Andrew.

Technical Support Information

Single copies of the following bulletins are made available to customers and industry consultants without charge. Simply call our Customer Support Center at 1-800-255-1479 to request those which would be helpful to you.

Bulletins referenced in Catalog 33

Catalog Page No.	Description	Bulletin No.
9	Antenna/Transmission Line Performance Calculator	8525 (English) M8525 (Metric)
56	Wind Forces on Parabolic Antennas	1015
56	Wind Forces on Horn Antennas	SP20-05
135	TRASAR® V Series High-Power UHF-TV Antennas	1359A
136	TRASAR H Series High-Power UHF-TV Antennas	1083K
138	TRASAR S Series Medium-Power Top Mount UHF-TV Antennas	1297C
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140	TRASAR L Series Low-Power UHF-TV Antennas	1313B
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Other Publications

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Microwave System Planning Worksheets:	
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Andrew Corporation
10500 West 153rd Street
Orland Park, IL U.S.A. 60462

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How to Use Your Catalog

Catalog 33 is divided into thirteen sections, identified in the "Table of Contents" on the right. To quickly locate a section, find the subject of interest in the "Table of Contents" and turn to the section having index tabs of the same color. Color coded section names also appear at the top of each page. You may also refer to the alphabetical "Index" on the facing front cover.

System Planning. The system planning section presents general planning and engineering data of interest to the system designer. Typical terrestrial microwave, satellite earth station, broadcast, cellular radio, land mobile radio and HF communications systems are illustrated. Numerous references to the product presentations are also provided.

Products. The product sections of this Catalog give detailed descriptions, specifications and ordering information for the Andrew line of standard products shown at right.

International Availability. The products listed in Catalog 33 are generally available worldwide. Exceptions are noted on the product pages and/or accompanying price list. All products, regardless of point of manufacture, are ordered through your local Andrew Sales Office, listed inside the back cover.

Prices. In many parts of the world, Catalog 33 is accompanied by a published price list. Contact your local Andrew Sales Office for additional pricing information.

Shipping Information. Approximate shipping dimensions and weights for shipments from U.S. and Canadian manufacturing locations are presented in the price lists. For information on shipments from other locations, contact your local Andrew Sales Office.

Additional Information. Andrew publishes a variety of technical bulletins, brochures and installation instructions which present detailed product and application information. Some of these bulletins are referenced in this Catalog. To obtain copies and for any other additional information, contact your local Andrew Sales Office.

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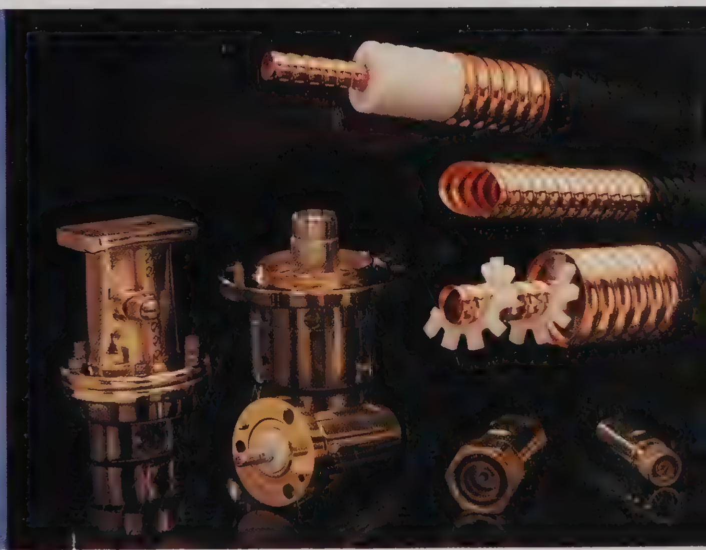
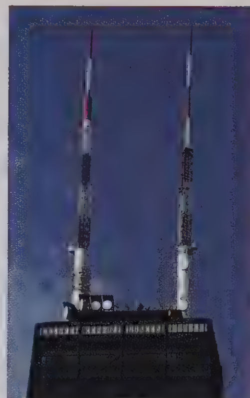
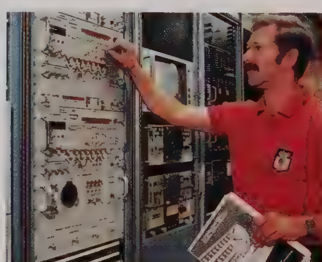






Andrew Corporation – A Key Supplier to the Telecommunications Industry

Why does the world telecommunications industry prefer antenna components and systems supplied by Andrew Corporation? Why has this organization grown in size, scope and skills, keeping pace with each industry advancement for over 50 years? The answer lies in the principles practiced by its founder, Victor J. Andrew, which are:

- Respond to customer needs with products that embody leading edge technology and are dependable and cost effective.
- Back this up with the strongest possible commitment to service after the sale.

Early Commitment to Broadcasting Continues to Grow

Andrew Corporation was founded January 1, 1937 by Victor J. Andrew. "Doc" Andrew, with his Ph.D in Physics, during the depression years, became a consultant to AM radio broadcasters. Doc soon learned that broadcasters needed more than consulting–they wanted a working system–so he became a supplier of products including directional antennas and transmission line. World War II brought new demands for coaxial cable and other products for military radio and radar systems, and Andrew Corporation became a manufacturer.

After the war, Doc returned to the broadcasters with rigid transmission lines for the FM station boom. His vision was to serve telecommunications worldwide and he transmitted that vision and know-how to a growing technical staff that translated his insight into products including advanced transmission lines for radio and TV, TRASAR® TV broadcasting antennas, and most recently to TV video distribution systems. Andrew supplied the earth station antennas for the first major video distribution network in 1978 and today is the turnkey supplier for the largest video distribution system in the world. All phases of system design, integration, software, installation and training can now be handled by Andrew. This ever expanding commitment to broadcasters is typical of the long-term associations Andrew has enjoyed with many segments in the telecommunications industry.

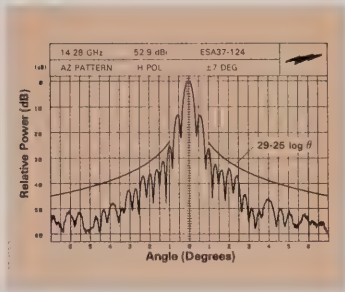
Defense Communications

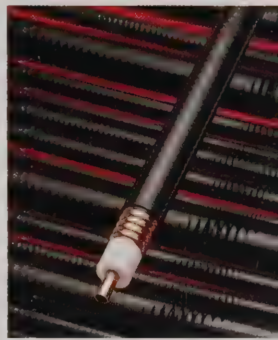
During the 1950's, again responding to the defense needs of the free world, Andrew participated in numerous design and construction programs for military communications and radar antenna systems. A facility in California was opened in 1951 to serve the West Coast defense markets. A Canadian facility was opened in 1953. Today, both continue to serve government users. Recent examples include the Canadian Air Traffic Control system modernization and earth station antennas to upgrade the DEW Line. HF communications projects begun in 1980 expanded in 1984 with acquisition of the Granger® HF antenna product family and now include advanced electronic and computer systems.

Upland, California, U.S.A. Whitby, Ontario, Canada Campbellfield, Victoria, Australia Lochgelly, Fife, U.K. Denton, Texas, U.S.

HELIAX® – Available Only From Andrew

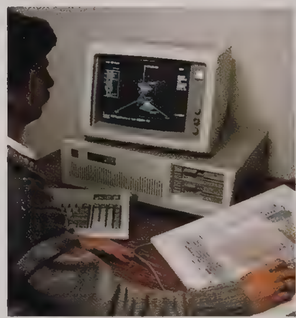
HELIAX coaxial cable and waveguide, introduced in 1953, continue to set the standard for RF performance and reliability. Andrew connectors are the most trouble free available. Andrew continues to respond to new applications with advanced cable products, and so has both the broadest product line and the accessories to make installation more cost effective and reliable. Customers around the world have come to depend on Andrew for quick service to "get on the air."





Technology That Meets Customer Needs

In the 1960's, Andrew R&D engineers began to seek new techniques to replace the older handbook rules and empirical design procedures that were standard in the industry. The approach chosen was to refine the theory of RF guided waves and apply computers to the design task. Today these computer-based design capabilities, unequalled in the world, allow Andrew engineers to shorten design cycles for faster response to telecommunications market advances. For example, Andrew earth station antennas were the first to meet U.S. FCC 2° pattern requirements while offering higher gain than earlier designs. Andrew microwave antennas lead the industry in pattern performance, mechanical qualities and long-term reliability.



Terrestrial Microwave

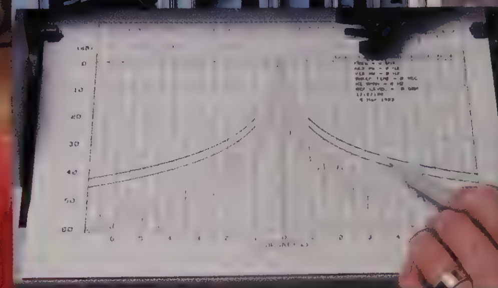
Andrew Corporation responded to the growth of long-haul telephone networks in the 1960's with advanced multi-band microwave antennas. A new facility was opened in the United Kingdom in 1966 to better serve European markets, and several Sales/Distribution offices have been established on the Continent. The same year, Andrew committed to a trans-Australian microwave system. That success created a strong and dependable Andrew organization in Australia that continues to satisfy the special demands of that market.

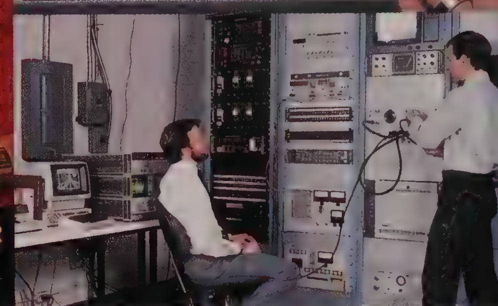
In the 1970's, the pace of intercity telephone market expansion quickened in the U.S. with authorization of the "Other Common Carriers", and by the 1980's many other countries were also authorizing additional sources of data and message service. Andrew expanded production capacity, opening a new factory in Denton, Texas. In 1983, the tower and shelter products of Grasis Corporation were acquired to enable expansion into turnkey antenna systems, utilizing facilities in Grandview, Missouri, and Fayetteville, Arkansas. Today, Andrew can supply all the elements for microwave, cellular or earth station antenna systems, including towers, equipment shelters, antennas, waveguide and cable, transportation, installation, project management and commissioning.

Put 50 Years of Experience to Work for You

The track record of successfully completed projects speaks for itself as the reason customers return to Andrew for their next system. The experience and skills built up over 50 years are described in Catalog 33 and are all available for your next project.

Grandview, Missouri, U.S.A. Fayetteville, Arkansas, U.S.A. Richardson, Texas, U.S.A. Orland Park, Illinois, U.S.A.





Andrew offers a comprehensive line of equipment and services for use in communications systems. Products and services are available individually or on a turn-key system basis for a wide range of stations and networks. Pages 6-42 present typical systems and other general information useful to the system designer. Andrew's turn-key system capabilities are described below.

Turn-Key Capability

Andrew's capability extends from the preliminary conceptual design to final performance certification of an operational facility. Andrew provides the experience and comprehensive system expertise in the areas of:

- Satellite communications systems for television and radio broadcast, telephony, digital and video conferencing
- Terrestrial microwave
- HF, VHF and UHF communications
- Corporate communications networks

Andrew's turn-key system capability stems from over 50 years of technological leadership in the telecommunications industry. With an established product line, expanded system engineering group, project management capabilities and a long standing dedication to customer service, Andrew provides a truly cost effective system capability.

Each turn-key communications system project requires a wide range of products, services and engineering disciplines. Andrew has developed the capabilities to address these requirements. These capabilities include:

- Comprehensive product line of antenna system equipment and related products described in this catalog
- Network analysis and feasibility studies
- Network engineering design
- Program management
- Pre-qualified OEM equipment suppliers
- Factory integration and testing
- Field Services including installation, diagnostic testing and maintenance
- Training and documentation
- Electronic product development including antenna system controllers, video receivers, monitor/control systems and specialty products

Andrew has developed the resources to provide specialized products to meet exacting system requirements. Examples of these are:

Computerized monitor and control systems for

- Satellite Uplink Facilities
- Satellite Receive Facilities
- Microwave Communications Facilities
- Mobile Radio Communications Systems

Satellite video receivers

- Broadcast quality – RS250B performance
- Frequency agile C and Ku Band operation

Earth station antenna control

- Azimuth, Elevation and Polarization Controllers
- Programmable Controllers
- Step Track Controllers
- Program Track Controllers

Custom software development

- Unique system requirements including distributed processing and custom network designs

Andrew's primary philosophy is to provide the most cost effective, reliable and timely solution to meet the customer's communications needs.

The system test program described below is an example of Andrew's commitment to deliver complete communication systems with proven performance and reliability.

Andrew offers a comprehensive program for testing earth station antenna facilities. A proprietary system developed by Andrew Engineering provides proof of performance evaluation with U.S. FCC 2° spacing regulations of installed earth station antennas. Evaluation testing is also provided for associated analog and digital electronic subsystems.

Typical system site tests include:

Antenna Subsystem

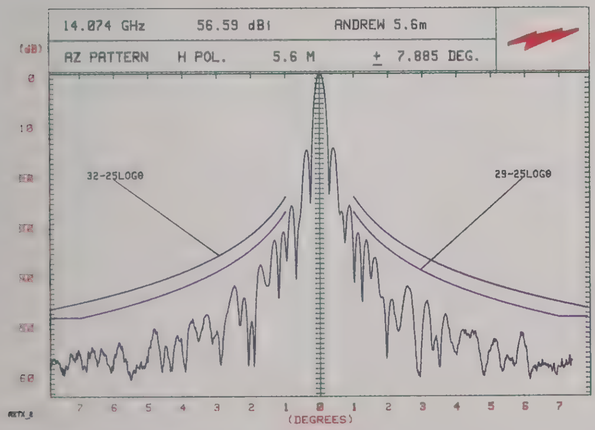
- Transmit and receive radiation patterns
- On-axis and off-axis cross-polarization discrimination
- Antenna VSWR (return loss)
- Antenna and system noise temperature profile
- Receive G/T profile
- Receive and transmit isotropic gain
- Interfacility link (IFL) testing of transmission line for VSWR (return loss), attenuation and group delay

Electronic Subsystem

- Complete performance testing to specifications on all components including:
  - — LNA/LNC
  - — Down converters/upconverters
  - — HPA
  - — Receivers
  - — Line amplifiers
  - — Switchers

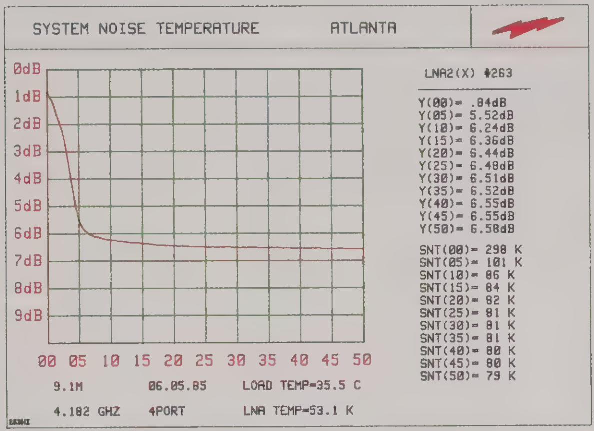
System Test Facility

The primary function of Andrew's earth station test facility is to support Andrew test engineers at the customer's site. The test facility is equipped with C- and Ku-band equipment, including large aperture earth station antennas. State of the art computer-controlled test equipment is utilized at the test facility and at the customer site for consistent and accurate result reporting, while offering disk storage of data and label files. The charts below indicate the types of test data provided to the customer.

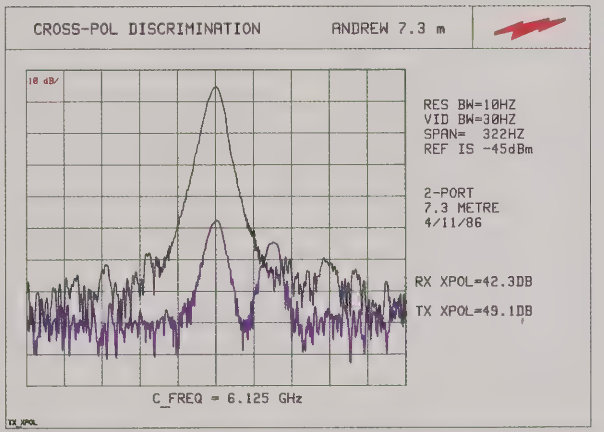


Field measured transmit radiation pattern. The test was performed via satellite and received at the Andrew System Test Facility on computer controlled test equipment.

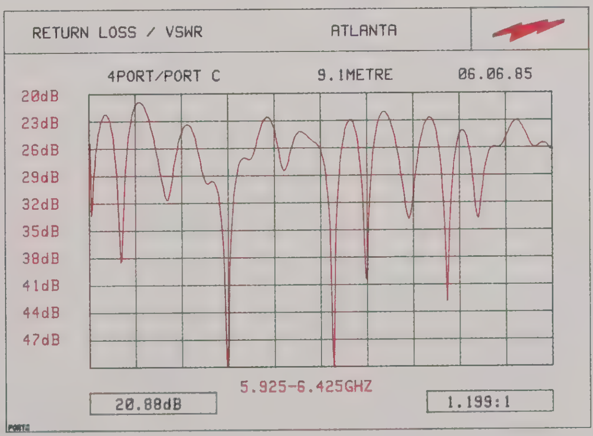
A video/audio signal is transmitted via satellite and downlinked at the customer site for evaluation of the receive system. Conversely, the signal can be transmitted from the customer site to the Andrew test facility where the transmit system performance can be evaluated using state of the art video and audio analysis systems.



System noise temperature profile shows increase in noise temperature and consequent decrease in G/T for decreasing elevation angles of the antenna.



Accurate determination of transmit and receive cross-polarization discrimination of an earth station antenna monitored via two opposite polarity transponders.



Return loss as seen by the High Power Amplifier (HPA) at feed of an Andrew 9.1-metre earth station antenna.

Introduction

Andrew offers complete antenna systems for point-to-point microwave service, including antennas, transmission lines, mounting hardware, pressurization equipment, towers, equipment shelters, and installation services.

Microwave Site Construction and Turnkey Installation

Andrew offers microwave site turnkey installation in many areas of the world, including North America and Australia. In addition to delivery, installation and testing of antenna systems, towers and shelters, we are prepared, through an expanded field service operation, to handle all of the other details necessary for site construction. Services offered include site clearing and grading, electrical work, construction of tower and building foundations, access roads and fences. Andrew will factory-install your radio racks and power source equipment in PLASTIDOME® or concrete shelters and deliver the complete package to the site. In addition, we will install and test your electronic equipment for full turnkey installation services. All of these services are offered on a turnkey basis or individually.

Andrew's field service and program management capabilities are described on pages 43-48.

Proper choice of a system is governed by frequency plan and coordination, site location, path characteristics, channel loading, tower considerations and cost. Andrew System Engineers can assist in the selection of components to assure that these parameters are combined most effectively.

System Performance Guarantees

Guaranteed performance specifications are presented throughout the product sections of this catalog. When the complete antenna/transmission line system is furnished by Andrew, system performance guarantees are also offered. The guarantees apply when installation is performed by Andrew Field Service or other properly trained and qualified crews.

Return Loss. Slight imperfections and mismatches in the transmission lines and antenna feeds cause small reflections of RF energy which contribute to system return loss (VSWR). Tolerance control during manufacture of Andrew components minimizes imperfections and provides low-VSWR performance. Every antenna feed, waveguide and microwave cable length is checked for VSWR across the operating band during and at the conclusion of the manufacturing process.

As a result of this thorough in-house product testing, we can predict accurately and guarantee system return loss performance. Typical peak VSWR's are given for the systems shown on pages 10-21. To obtain specific system guarantees, contact your local Andrew Sales Office listed inside the back cover.

Echo-Distortion Noise occurs in all transmission line systems. The noise is produced by reflections at both ends of the transmission line as well as reflections within the transmission line. To reduce echo-distortion noise to a minimum, it is necessary that the reflection coefficient (VSWR) of the antenna and the radio or circulator network be as low as possible. Further, the transmission line should also exhibit a low reflection coefficient such that multiple reflections along the transmission line are minimized.

Andrew has developed equipment and methods to measure directly the transmission line noise of a single transmission line in the laboratory. The data obtained has been compiled so that noise performance guarantees for a wide variety of antenna/transmission line/circulator network combinations can be provided. They include all the popular microwave frequency bands and 600 to 2700 channel loadings.

Intermodulation Noise. Certain frequency plans can result in intermodulation noise (2A-B) generation within the antenna/transmission line systems. Intermittent or oxidized contacts in the current path inside the transmission line can generate intermodulation products due to diode action.

Andrew products are designed to minimize the causes of intermodulation. Waveguide connectors use high contact pressures on the flare, and flange flatness on antenna feeds and waveguide components is maintained to close tolerance.

Andrew antenna/transmission line systems can be used for fully-loaded frequency plans. Measurements on actual systems permit optional guarantees of –125 dB or more for intermodulation noise levels.

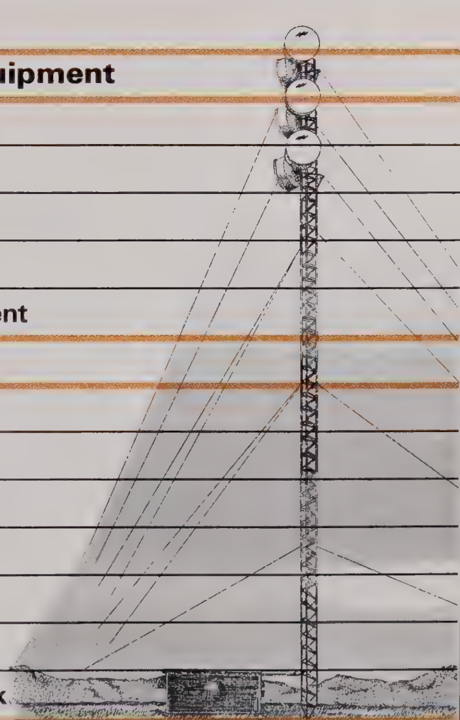
For more information on Andrew system guarantees, contact your local Andrew Sales Office listed inside the back cover.

Structures and Equipment

- Microwave Antennas
- Transmission Lines
- Tower
- Shelter
- Pressurization Equipment

Services

- Program Management
- Material Delivery
- Assembly
- Installation
- Path Alignment
- System Testing
- Foundations/Civil Work



dB and dBm

The dB (decibel) is a logarithmic unit comparing two power levels.

$$dB = 10 \log_{10} \frac{P_1}{P_2}$$

Where P_1 is the larger power

If $P_1 = 10$ watts and $P_2 = 1$ watt, then

$$dB = 10 \log_{10} \frac{10}{1} = 10 \text{ dB}$$

The dBm is a comparison to a reference power of 1 milliwatt (0.001 watt).

$$dBm = 10 \log_{10} \frac{P_1}{0.001}$$

If $P_1 = 5$ watts, then

$$dBm = 10 \log_{10} \frac{5}{0.001} = 37 \text{ dBm}$$

Power (Watts)	dBm
1	30
2	33
5	37
10	40
20	43

Free Space Propagation Attenuation (Isotropic)

$$L_{fs} = 96.6 + 20 \log_{10} D + 20 \log_{10} f$$

Where L_{fs} = loss in free space (dB)
D = path length in miles
f = frequency in GHz

For a path length of 30 miles at 6.175 GHz:

$$\begin{aligned} L_{fs} &= 96.6 + 20 \log_{10} 30 + 20 \log 6.175 \\ &= 96.6 + 29.5 + 15.8 \\ &= 141.9 \text{ dB} \end{aligned}$$

Calculating Receive Signal Level and Antenna Gain

When transmitter power is expressed in dBm and all other units are expressed in dB, receive power in dBm can be calculated using the following formula:

$$P_r = P_t - L_{w_1} + L_{f_1} + G_{a_1} - L_{fs} + G_{a_2} - L_{w_2} - L_{f_2}$$

Where: P_r = receive power level (dBm)
P_t = transmit power (dBm)
L_w = transmission line losses
L_f = filter losses
L_{fs} = free space path loss
G_{a_1} = transmit antenna gain
G_{a_2} = receive antenna gain

Thus, for a 6.175 GHz system with a transmit power of 5 watts (37 dBm) and 200 feet of Type EWP52 HELIAX® elliptical waveguide (attenuation 1.2 dB/100 feet) at each end, filter losses of 0.5 dB at each end, and Andrew UHX8-59H antennas at each end (Mid-band Gain 41.3 dB) over a path 30 miles long (L_{fs} = 141.9 per preceding example).

$$\begin{aligned} P_r &= 37 - 2.4 - .5 + 41.3 - 141.9 + 41.3 - 2.4 - .5 \\ &= -28.1 \text{ dBm} \end{aligned}$$

When the minimum receive signal level required to meet performance objectives (C) is known and the necessary fade margin (FM) is added, the total antenna gain (G_t) required can be calculated using the following expression:

$$G_t = P_t - L_{w_1} - L_{f_1} - L_{fs} - L_{w_2} - L_{f_2} - FM - C$$

In the above system with a transmit power of 5 watts (37 dBm), 200 feet of EWP52 elliptical waveguide (attenuation of 1.2 dB/100 ft) at each end, filter losses of 0.5 dB at each end, operating over a 30 mile path, assuming a receive signal threshold level requirement (C) of –70 dBm and a desired fade margin of 38 dB, the total antenna gain (G_t) required is:

$$\begin{aligned} G_t &= 37 - 2.4 - .5 - 141.9 - 2.4 - .5 - 38 - (-70) \\ &= -78.7 \end{aligned}$$

To achieve the system performance goal, a negative gain (loss) of 78.76 dB must be made up by the gain of the antennas. If antennas with equal gain are used at each end of the path, each antenna must then have a gain of 39 dB. Andrew UHX8-59H antennas with a mid-band gain of 41.3 dB will, therefore, satisfy the requirement.

Calculation of System Return Loss

Resultant system return loss is governed by the phase relations between the standing waves of individual components and cannot be precisely calculated. The resultant return loss can be estimated, however, using the procedure described below. The 0.7 multiplication factor, mentioned in Step 5, is based on data taken by Andrew on thousands of antenna systems. Properly installed transmission systems will typically measure well within the calculated resultant return loss. Andrew specifications include safety margins and components are typically better than the published return loss specifications. For this reason, systems using all Andrew components will usually ensure much better system return loss performance than the calculated values.

A conversion table for VSWR, Return Loss and Reflection Coefficient appears on page 312.

Step 1. Using the table on page 312, convert VSWR or RL to reflection coefficients, in decimal form, for all components in the system.

Step 2. Divide components into three groups:
— Top (antenna, radome, flex, etc.)
— Transmission Line (waveguide or cable feeder)
— Bottom (flex, elbow, pressure window, etc.)

Step 3. Add the reflection coefficient of all top components and convert the total to RL. Double the calculated attenuation in dB of the transmission line feeder and add this to the previous figure. Then convert the total back to a reflection coefficient.

Step 4. To the final reflection coefficient obtained in Step 3, add the reflection coefficient of the transmission line and all bottom components.

Step 5. Multiply the total reflection coefficient from Step 4 by 0.7 and convert the result to VSWR or return loss.

Example

Steps 1 and 2:

Antenna/Transmission Line System

	VSWR	Reflection Coefficient
Top Components		
Antenna	1.06	0.029
Flex Section	1.03	0.015
Transmission Line		
Waveguide, Attenuation: 2.36 dB	1.06	0.029
Bottom Components		
Flex Section	1.03	0.015
Pressure Window	1.01	0.005

Step 3:

(1) Add top components [0.029 + 0.015 = 0.044]

(2) Convert to return loss (from table on page 312) [27.1 dB]

(3) Double Transmission Line attenuation [2 x 2.36 = 4.72 dB]

(4) Add (2) and (3) [27.1 + 4.72 = 31.8 dB]

(5) Convert 31.8 dB to reflection coefficient = 0.026 (from table on page 312)

Step 4:

(6) Add (5) and transmission line and bottom components [0.026 + 0.029 + 0.015 + 0.005 = 0.075]

Step 5:

(7) Multiply (6) by 0.7 [0.075 x 0.7 = 0.0525

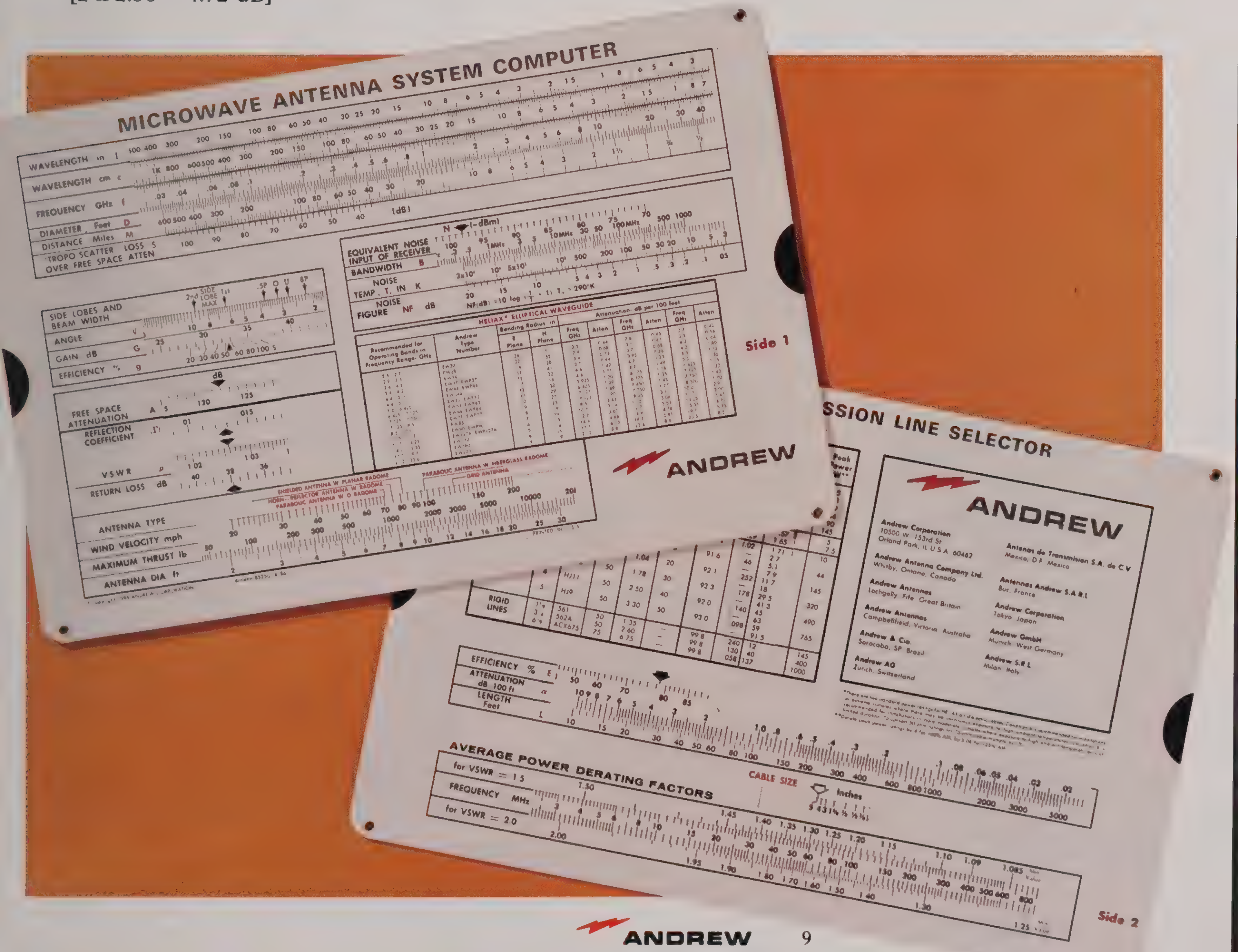
Convert to VSWR = 1.1 (from table on page 312) [1.1 is estimated peak system VSWR]

Convert to Return Loss = 25.5 (from table on page 312) [25.5 dB is estimated peak system return loss]

Microwave Antenna System Computer

Andrew's "Microwave Antenna System Computer/Transmission Line Selector" is available on request. The computer includes useful scales and tables for calculating parabolic antenna characteristics, free space propagation, HELIAX® cable and waveguide performance, and other antenna system calculations.

To obtain a copy, contact your local Andrew Sales Office listed inside the back cover and ask for Bulletin 8525 (English units) or M8525 (metric units).



Terrestrial Microwave – HELIAX® Coaxial Cables

A typical microwave antenna system using HELIAX coaxial cable is illustrated on the right. The item numbers in the table refer to those shown in the illustration.

HELIAX air-dielectric cable and Andrew low-VSWR and high performance antennas offer low system VSWR, low transmission line attenuation, and are suitable for all 2 GHz microwave point-to-point applications.

HELIAX foam-dielectric cable and "F" series unpressurized antennas eliminate the need for pressurization equipment. "F" series antennas have a special flange which has dielectric material up to the flange face eliminating any space where moisture can collect.

The typical antenna system peak VSWR listed in the table is measured at the radio equipment end connector (item 8). The antenna, 150 ft (45 m) of HELIAX cable, and all cable components (1) through (8) are included. Contributions due to a molded radome and the optional jumper are not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Transmission Line System – Pressurized

Item No.	Description	7/8" Below 1700 MHz	7/8" Above 1700 MHz	1-1/4" Above 1700 MHz	1-5/8" Above 1700 MHz	1-5/8" Low VSWR Above 1700 MHz	See Pages
	Antenna Input Impedance	7/8" EIA 50 ohm	7/8" EIA 50 ohm	7/8" EIA 50 ohm	7/8" EIA 50 ohm	7/8" EIA 50 ohm	
1	7/8" EIA Flange Connector	75AR	75RT	L46S	87ST	87ST	241, 243
3	HELIAX Air-Dielectric Cable	HJ5-50	HJ5P-50	—	HJ7P-50A	HJ7SP-50A	240, 242
3	HELIAX Foam-Dielectric Cable	—	—	LDF6P-50*	—	—	
4	Grounding Kit (3-points)	204989-2	204989-2	204989-3	204989-4	204989-4	255
5	Transmission Line Support	Support Angle/Threaded Rod Kit					253, 297
6	Hanger	42396A-5	42396A-5	42396A-1	42396A-2	42396A-2	253
7	Waveguide Boot	48939-1	48939-1	48939-3	48939-4	48939-4	256
	Feed-Thru Plate	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	256
8	7/8" EIA Flange Connector	75AG	75GT	L46S	87SGT	87SGT	243
	N Jack Alternate Connector	75AN	75NT	L46N	87NT	—	241
9	Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)						
	1700-2300 MHz	—	200834-3	200834-3	200834-3	200834-3	240
	2500-2700 MHz	—	202638-3	202638-3	202638-3	202638-3	240
9	Optional Jumper, N Plug/N Plug, 3 ft (1 m)						
	Below 1427 MHz	201123	—	—	—	—	248
	1427-1535 MHz	44202-3	—	—	—	—	240
	1700-2300 MHz	—	41656B-3	41656B-3	41656B-3	41656B-3	240
	2300-2700 MHz	—	48695-3	48695-3	48695-3	48695-3	240
	Typical Antenna System Peak VSWR (R.L., dB)	1.15 (23.1)	1.10 (26.4)	1.18 (21.6)	1.18 (21.6)	1.13 (24.3)	
	Based on Antenna VSWR (R.L., dB)	1.10 (26.4)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)	

*Type LDF6P-50 includes pressure path for use with air-dielectric antennas. **Number of openings.

Transmission Line System – Unpressurized

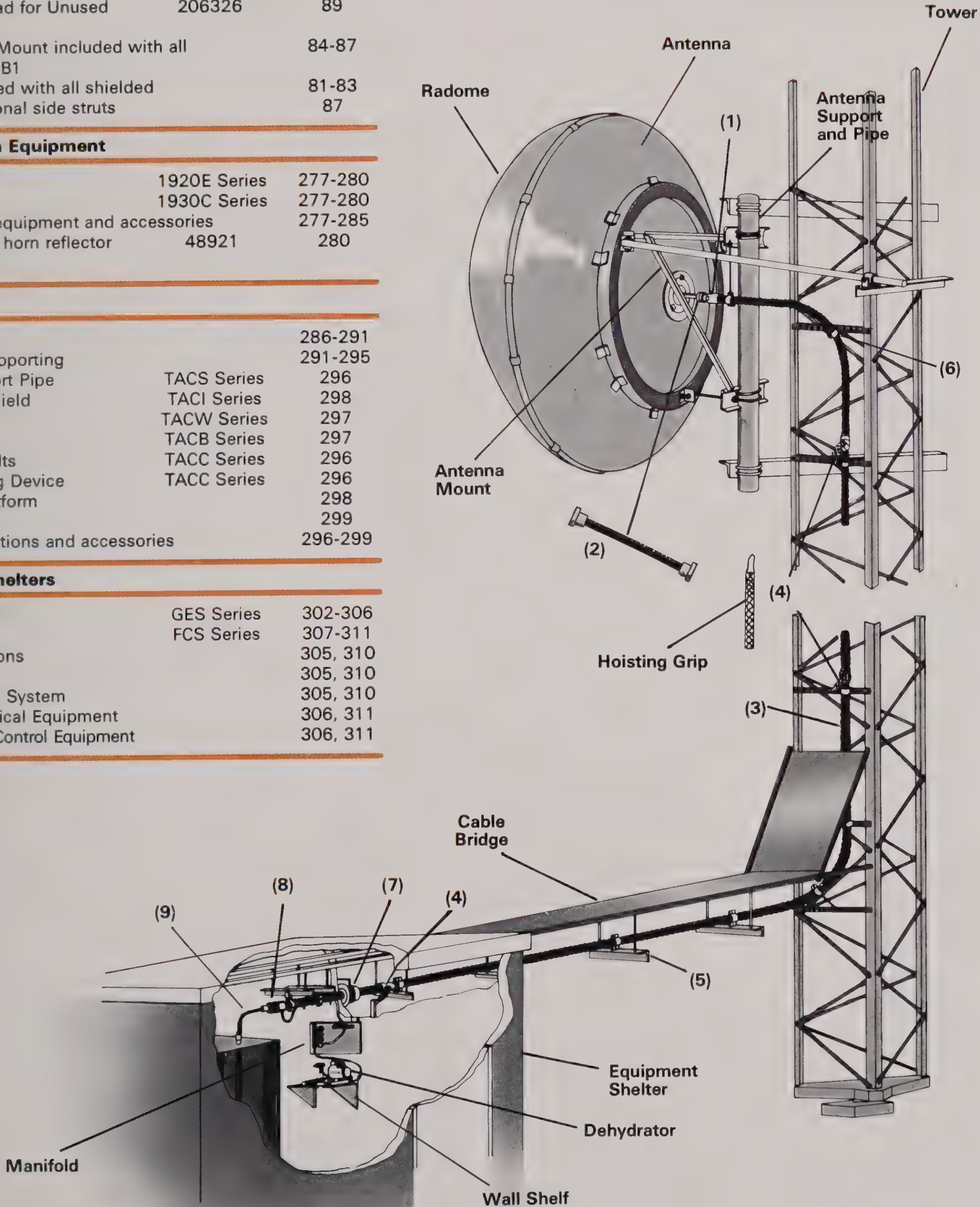
Item No.	Description	7/8" Below 1427 MHz	1/2" Above 1427 MHz	7/8" Above 1427 MHz	1-1/4" Above 1427 MHz	1-5/8" Above 1427 MHz	See Pages
	Antenna Input Impedance	"F" Flange 50 ohm	"F" Flange 50 ohm	"F" Flange 50 ohm	"F" Flange 50 ohm	"F" Flange 50 ohm	
1	"F" Flange Connector, male	L45F	L44F	L45F	L46F	L47F	241
1	"F" Flange Connector, female	48041	—	48041	—	201942	241
2	Optional Jumper, "F" male/"F" male 3 ft (1 m)						
	1700-2300 MHz	—	—	202376-3	—	202376-3	
3	HELIAX Foam-Dielectric Cable	LDF5-50A	LDF4P-50A	LDF5P-50A	LDF6P-50	LDF7P-50A	240
4	Grounding Kit (3-points)	204989-2	204989-1	204989-2	204989-3	204989-4	255
5	Transmission Line Support	Support Angle/Threaded Rod Kit					253, 297
6	Hanger	42396A-5	42311	42396A-5	42396A-1	42396A-2	253
7	Waveguide Boot	48939-1	48939-5	48939-1	48939-3	48939-4	256
	Feed-Thru Plate	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	256
8	7/8" EIA Flange Connector	L45R	L44R	L45R	L46R	—	241
	N Jack Alternate Connector	L45N	L44N	L45N	L46N	L47N	241
9	Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)						
	1700-2300 MHz	—	—	200834-3	200834-3	—	240
	2500-2700 MHz	—	—	202638-3	202638-3	—	240
9	Optional Jumper, N Plug/N Plug						
	Below 1427 MHz	201123	—	—	—	—	248
	1427-1535 MHz	—	—	44202-3	44202-3	44202-3	240
	1700-2300 MHz	—	—	41656B-3	41656B-3	41656B-3	240
	2300-2700 MHz	—	—	48695-3	48695-3	48695-3	240
	Typical Antenna System Peak VSWR (R.L., dB)	1.19 (21.2)	1.19 (21.2)	1.21 (20.5)	1.22 (20.0)	1.22 (20.0)	
	Based on Antenna VSWR (R.L., dB)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	

**Number of openings.

System Components

Description	Type Number	See Pages
Antenna Equipment		
Parabolic Antennas:		49-67
Ultra High Performance	UHP Series	
High Performance	HP and HPX Series	
Standard	PL, PXL, P, PX Series	
Grid	GPL and GP Series	
GRIDPAK™	KP Series	
Horn Reflector Antennas	SHX10B1	88-91
WC281 to 7/8" EIA, 50 ohm Transition	203105	89
Termination Load for Unused Port, 7/8" EIA	206326	89
Vertical Tower Mount included with all except SHX10B1		84-87
Radome included with all shielded		81-83
Optional additional side struts		87
Pressurization Equipment		
Dehydrator	1920E Series	277-280
Dehydrator	1930C Series	277-280
Pressurization equipment and accessories		277-285
Lectrodryer (for horn reflector antenna)	48921	280
Tower		
Tower, guyed		286-291
Tower, Self-Supporting		291-295
Antenna Support Pipe	TACS Series	296
Antenna Ice Shield	TACI Series	298
Cable Supports	TACW Series	297
Cable Bridge	TACB Series	297
Ladder/Stepbolts	TACC Series	296
Safety Climbing Device	TACC Series	296
Work/Rest Platform		298
Light Kit		299
Other tower options and accessories		296-299
Equipment Shelters		
PLASTIDOME®	GES Series	302-306
Concrete	FCS Series	307-311
Structural Options		305, 310
Door Options		305, 310
Basic Electrical System		305, 310
Optional Electrical Equipment		306, 311
Environmental Control Equipment		306, 311

Engineering, Program Management and Field Services	
System Design Assistance	43-48
Program Management	43-48
Foundations/Civil	43-48
Freight	43-48
Delivery and Assembly	43-48
Installation	43-48
Path Alignment	43-48
System Testing	43-48



A typical microwave antenna system using HELIAX elliptical waveguide and rectangular waveguide components is illustrated on page 13. Item numbers in the illustration are referenced in the tables below.

Low-VSWR antennas and low-VSWR waveguide components are recommended for long-haul or high channel density CCIR systems.

HELIAX elliptical waveguide is the standard of the microwave industry for antenna feeder applications and is recommended for most systems in the 3.4-23.6 GHz bands except where absolute minimum attenuation is needed and circular waveguide is required.

The antenna system peak VSWR listed is measured at the pressure window. Contributions due to a 150 ft (45 m) elliptical waveguide run and all waveguide components, except for optional flex section and elbow, are included. A planar radome, where applicable, is included; an optional molded radome is not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Transmission Line System Components

Item No.	Description	3.4 to 4.2 GHz	4.4 to 5.0 GHz	5.6 to 6.425 GHz	6.425 to 7.125 GHz	7.125 to 7.750 GHz	7.125 to 8.5 GHz	See Pages
	Waveguide Flanges	CPR229G	UG-148C/U UG-149A/U	CPR137G	CPR137G	CPR137G	CPR112G	
1	Flex-Twist Section	55421-24	52095-24	55415-24	55415-24	55415-24	55413-24	204, 205
2	Connector	137DET	144DCT	252DET	163DET	164DET	177DET	186, 187
3	Elliptical Waveguide	EWP37	EWP44	EWP52	EWP63	EWP64	EWP77	180-194
4	Grounding Kit (3-points)	204989-5	204989-4	204989-4	204989-4	204989-3	204989-3	192
5	Transmission Line Support	Support Angle/Threaded Rod Kit						191, 297
6	Hanger	42396A-4	42396A-2	42396A-8	42396A-7	42396A-1	42396A-11	190
7	Waveguide Boot	48939-37	48939-44	48939-52	48939-63	48939-64	48939-77	193
8	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	193
9	Connector	137DET	144DCT	252DET	163DET	164DET	177DET	186, 187
10	Pressure Window	55001-229	55000-187	55001-137	55001-137	55001-137	55001-112	204, 205
11	90° Elbow, E Plane	55402-229	55220-187	55402-137	55402-137	55402-137	55402-112	204, 205
	H Plane	55403-229	55221-187	55403-137	55403-137	55403-137	55403-112	204, 205
	Typical Antenna System Peak VSWR (R. L., dB)	1.10 (26.4)	1.09 (27.3)	1.08 (28.3)	1.08 (28.3)	1.08 (28.3)	1.08 (28.3)	
	Based on Antenna VSWR (R.L., dB) and Frequency Range, GHz	1.06 (30.7) 3.7-4.2	1.05 (32.3) 4.4-5.0	1.06 (30.7) 5.925-6.425	1.06 (30.7) 6.425-7.125	1.06 (30.7) 7.125-7.750	1.06 (30.7) 7.725-8.500	

*Specify number of openings.

Transmission Line System Components

Item No.	Description	10.5 to 11.7 GHz	12.2 to 13.25 GHz	14.4 to 15.35 GHz	17.7 to 19.7 GHz	21.2 to 23.6 GHz	See Pages
	Waveguide Flanges	CPR90G	WR75 choke or cover	UG-419/U UG-541/U	UG-595 UG-596A/U	UG-595 UG-596A/U	
1	Flex-Twist Section	55411-24	51747-24	53215-24	163619-24	163619-24	204, 205
2	Connector	190DET	1127DCT	1132DCT	1180DCT	1220SC	186, 187
3	Elliptical Waveguide	EWP90	EWP127A	EWP132	EWP180	EWP220	180-194
4	Grounding Kit (3-points)	204989-2	204989-2	204989-2	204989-1	204989-1	192
5	Transmission Line Support	Support Angle/Threaded Rod Kit					191, 297
6	Hanger	42396A-5	42396A-9	31766-13	201184	43211	190
7	Waveguide Boot	48939-90	48939-127	48939-132	48939-180	48939-220	193
8	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	193
9	Connector	190DET	1127DCT	1132DCT	1180DCT	1220SC	186, 187
10	Pressure Window	55001-90	55000-75	55000-62	55000-42	55000-42	204, 205
11	90° Elbow, E Plane	55402-90	55220-75	55220-62	55220-42	55220-42	204, 205
	H Plane	55403-90	55221-75	55221-62	55221-42	55221-42	204, 205
	Typical Antenna System Peak VSWR (R.L., dB)	1.07 (29.4)	1.11 (25.7)	1.10 (26.4)	1.11 (25.7)	1.11 (25.7)	
	Based on Antenna VSWR (R.L., dB) and Frequency Range, GHz	1.06 (30.7) 10.7-11.7	1.10 (26.4) 12.7-13.25	1.10 (26.4) 14.4-15.35	1.15 (23.1) 17.7-19.7	1.15 (23.1) 21.2-23.6	

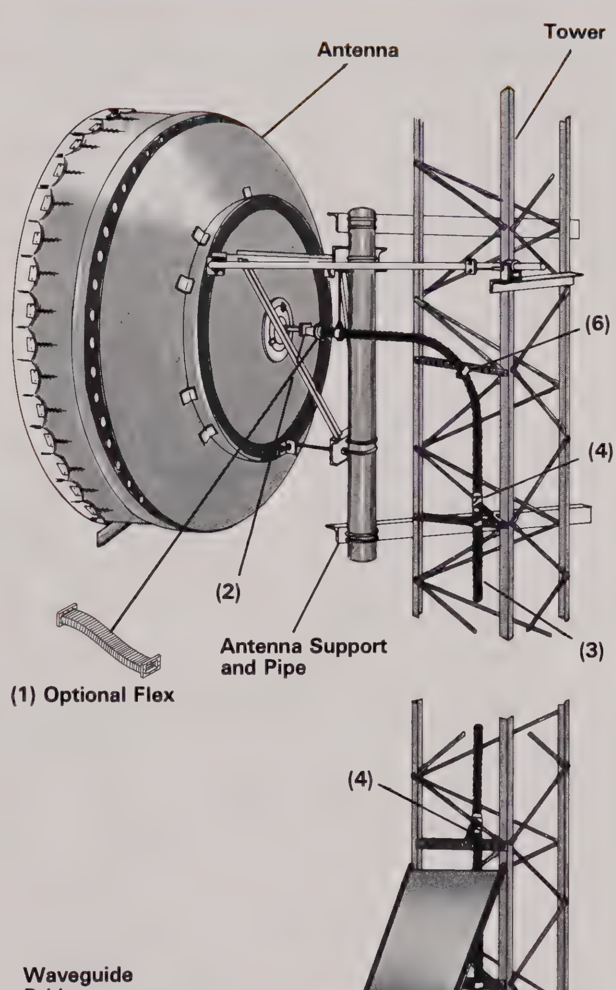
*Specify number of openings

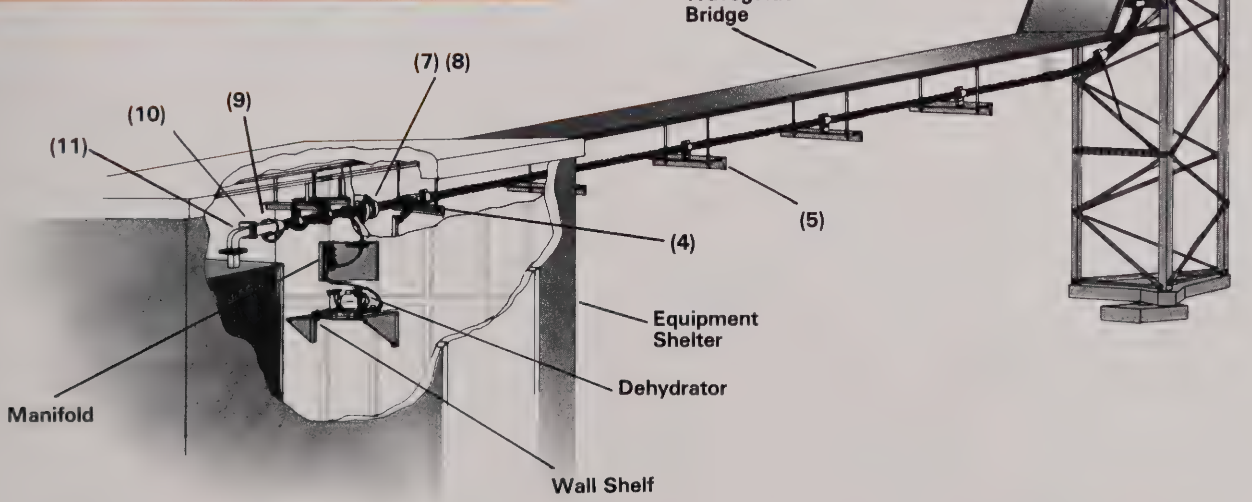
System Components

Description	Type Number	See Pages
Antenna Equipment		
Antennas:		49-82
UHX II® Ultra High Performance	UHX Series	
UHX® Ultra High Performance	UHX Series	
UMX® Multiband	UMX Series	
HXPD High XPD	HXPD Series	
HP and HPX High Performance	HP and HPX Series	
UGX® Ultra Gain	UGX Series	
Focal Plane	FP, FPX Series	
Standard	PL, PXL, P, PX Series	
Local Distribution	LD Series	
Vertical tower mount is included with all except UMX( )-459 Series		84-87
Radome is included with all shielded antennas		81-83
Termination loads for unused port of dual polarized antenna		66-78
Optional additional side struts		87
Pressurization Equipment		
Dehydrator	1920E Series	277-280
Dehydrator	1930C Series	277-280
Pressurization equipment and accessories		277-285
Tower		
Tower, guyed		286-291
Tower, Self-Supporting		291-295
Antenna Support Pipe	TACS Series	296
Antenna Ice Shield	TACI Series	298
Waveguide Supports	TACW Series	297
Waveguide Bridge	TACB Series	297
Ladder/Stepbolts	TACC Series	296
Safety Climbing Device	TACC Series	296
Work/Rest Platform		298
Light Kit		299
Other tower options and accessories		296-299
Equipment Shelters		
PLASTIDOME	GES Series	302-306
Concrete	FCS Series	307-311
Structural Options		305, 310
Door Options		305, 310
Basic Electrical System		305, 310
Optional Electrical Equipment		306, 311
Environmental Control Equipment		306, 311

Engineering, Program Management and Field Services

System Design Assistance	43-48
Program Management	43-48
Foundations/Civil	43-48
Freight	43-48
Delivery and Assembly	43-48
Installation	43-48
Path Alignment	43-48
System Testing	43-48





A typical microwave antenna system using a low-VSWR antenna, circular waveguide, HELIAX® elliptical waveguide and premium rectangular waveguide components is illustrated on the right. The item numbers on the table refer to those shown in the illustration.

Circular waveguide is used to minimize transmission line attenuation in standard and low-VSWR antenna systems and is normally installed in long, vertical runs.

The typical antenna system peak VSWR is measured at the pressure window (item 18). The circular waveguide run is 300 feet (91 m) and the elliptical run is 25 feet (8 m). A 1.06 VSWR (except -127 Series 1.10) antenna with planar radome and all waveguide components shown, except the optional elbow, are included.

The typical microwave antenna systems described below are examples only, not complete product listings. See referenced pages for further information.

Transmission Line Components

Item No.	Description	3.7 to 4.2 GHz	5.925 to 6.425 GHz	6.425 to 7.125 GHz	7.725 to 8.5 GHz	10.7 to 11.7 GHz	12.7 to 13.2 GHz	See Pages
	Waveguide Flanges	WC269	WC166	WC166	WC166	WC109	WC109	
1	Elliptical Waveguide Twist (see notes)	55421-24*	44730-1	44730-1	44978	45029	44910	194
2	Dual-Pol. Transition w/o mode filter	64270A	62866A-1	64147A-1	64703A-1	64100A-107	68998	197
3	Circular Waveguide Straight Section	64269-240	49608-240	49608-240	49608-240	54346-240	54346-240	196
4	Rigid Hanger	19007A-269	69932	69932	69932	19007A-109	19007A-109	201
5	Sliding Hanger	—	69933	69933	69933	19008A-109	19008A-109	201
6	Spring/Sliding Hanger	19009A-269	69934	69934	69934	19009A-109	19009A-109	201
7	Axial Ratio Compensator	64271	57568	57568	57568	54348	54348	199
8	Dual-Pol. Transition with mode filter	65326	65236-1	65238-1	65316-1	65241-107	68999	197
9	EW Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186-189
10	Elliptical Waveguide	EWP37	EWP52	EWP63	EWP77	EWP90	EWP127A	186-189
11	EW Sliding Support	200970	200970	200970	200970	200970	200970	201
12	EW Hanger	42396A-4	42396A-8	42396A-7	42396A-11	42396A-5	42396A-9	190
13	Transmission Line Support			Support Angle/Threaded Rod Kit				191, 297
14	Grounding Kit	204989-5	204989-4	204989-4	204989-3	204989-2	204989-2	192
15	Waveguide Boot	48939-37	48939-52	48939-63	48939-77	48939-90	48939-122	193
16	Feed-Thru Plate	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	193
17	EW Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186-189
18	Pressure Window	55001-229	55001-137	55001-137	55001-112	55001-90	55000-75	204, 205
19	90° Elbow, E Plane	55402-229	55402-137	55402-137	55402-112	55402-90	55220-75	204, 205
	H Plane	55403-229	55403-137	55403-137	55403-112	55403-90	55221-75	204, 205
	Typical Antenna System Peak VSWR (R. L., dB)	1.15 (23.3)	1.12 (24.9)	1.12 (24.9)	1.13 (24.3)	1.11 (25.6)	1.13 (24.3)	

*Rectangular waveguide flex-twist.
**Specify number of openings.

Note: Elliptical waveguide twist is recommended for installations with 3-14 ft (1-4.2 m) interconnect.

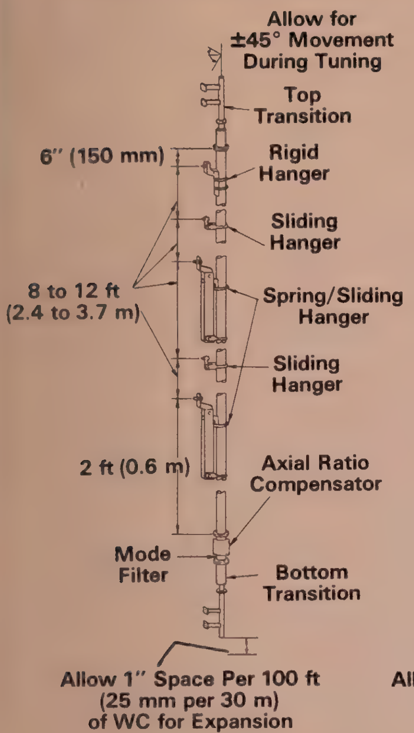
System Components

Description	Type Number	See Pages
Antenna Equipment		
Antennas:		49-80
UHX II® Ultra High Performance	UHX Series	
UHX® Ultra High Performance	UHX Series	
UMX® Multiband	UMX Series	
HXPD High XPD	HXPD Series	
HP and HPX High Performance	HP and HPX Series	
UGX® Ultra Gain	UGX Series	
Focal Plane	FP, FPX Series	
Standard	PL, PXL, P, PX Series	
Local Distribution	LD Series	
Vertical tower mount is included with all except UMX( )-459 Series		84-87
Radome is included with all shielded antennas		81-83
Termination loads for unused port of dual polarized antenna		66-78
Optional additional side struts		87
Pressurization Equipment		
Dehydrator	1920E Series	277-280
Dehydrator	1930C Series	277-280
Pressurization equipment and accessories		277-285

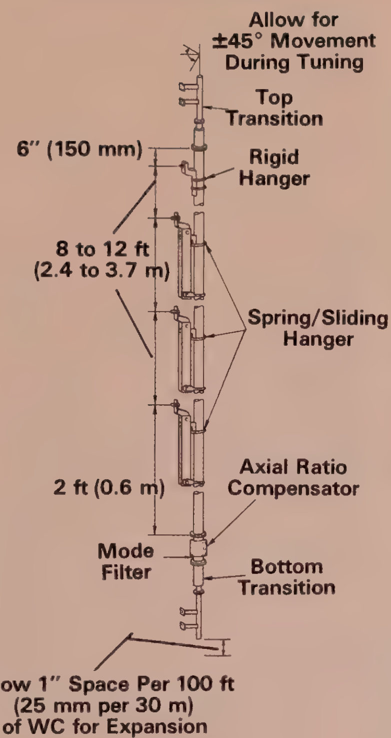
Description	Type Number	See Pages
Tower		
Tower, guyed		286-291
Tower, self-supporting		291-295
Other tower options and accessories		296-299
Equipment Shelters		
PLASTIDOME®	GES Series	302-306
Concrete	FCS Series	307-311
Shelter Options		305, 310
Engineering, Program Management and Field Services		
System Design Assistance		43-48
Program Management		43-48
Foundations/Civil		43-48
Freight		43-48
Delivery and Assembly		43-48
Installation		43-48
Path Alignment		43-48
System Testing		43-48

Positioning on the Tower

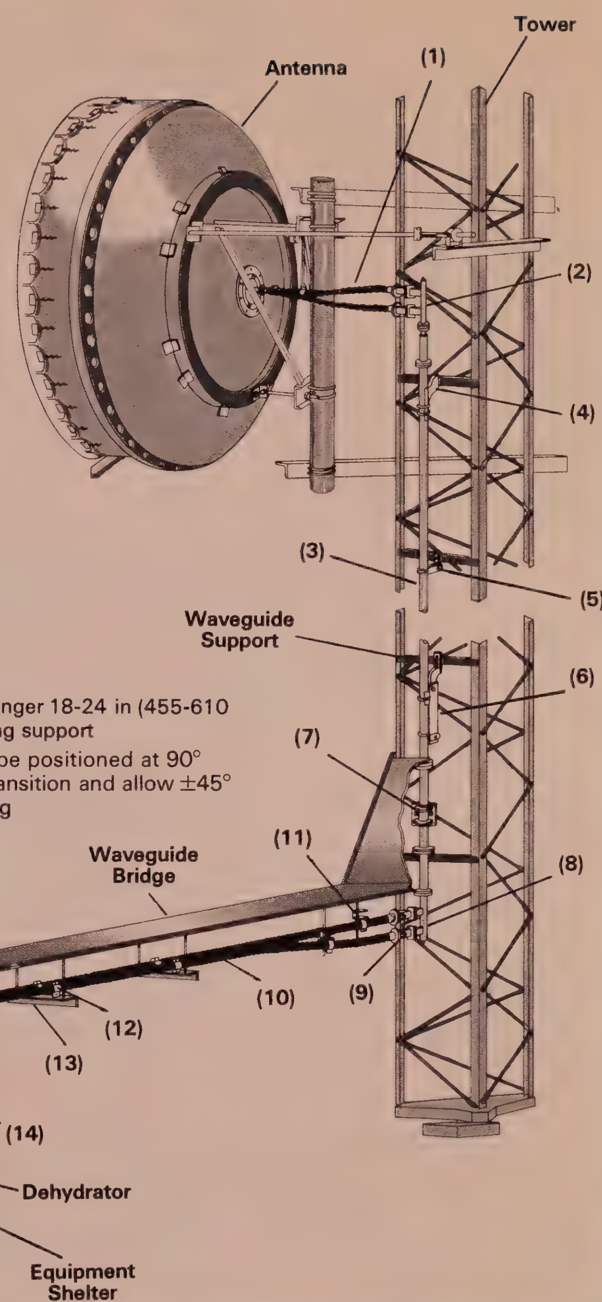
WC109 and WC166



WC205 and WC269

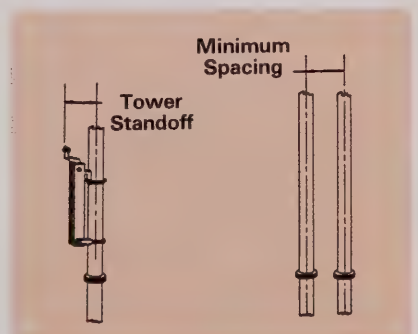


- Position hangers as illustrated above
- Attach top rigid hanger to member capable of supporting entire run
- Maximum deviation from true straight should be 1.5 in per 20 ft (38 mm per 6 m)
- Position elliptical waveguide sliding support 18-24 in (455-610 mm) from bottom transition
- Position first EWG hanger 18-24 in (455-610 mm) from EWG sliding support
- Top transition must be positioned at 90° multiple of bottom transition and allow ±45° rotation during tuning



Tower Standoff and Minimum Spacing

Waveguide Type	Tower Standoff in (mm)	Minimum Spacing in (mm)
WC109	2.9 (73)	4.9 (124)
WC166	3.1 (78)	5.8 (147)
WC205	3.4 (87)	6.3 (160)
WC269	4.0 (101)	6.8 (171)



Transmission Line Components – Single-Band System

Item No.	Description	3.7 to 4.2 GHz	5.925 to 6.425 GHz	6.425 to 7.125 GHz	7.725 to 8.275 GHz	10.7 to 11.7 GHz	12.7 to 13.2 GHz	See Pages
	Antenna Type	SHX10B1	SHX10C1	SHX10B1	SHX10B1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC281	WC166	WC281	WC281	WC281	WC281	
1	Taper Transition	69273	—	69271	69271	69271	69269	198
3	Dual-Pol. Cir. to Rect. Waveguide Transition	64270A	62866A-1	64147A-1	64703A-1	69383	68998	197
5	Network Drain	48001-2	48001-2	48001-2	48001-2	48001-2	48001-2	198
6	Flex Twist (optional)	55421-24	55415-24	55415-24	55413-24	55411-24	51747-24	204, 205
	and Hanger	66412-229	66412-137	66412-137	—	66412-90	—	
7	EWG Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186, 187
8	Elliptical Waveguide	EWP37	EWP52	EWP63	EWP77	EWP90	EWP127	180-194
9	Grounding Kit (3 points)	204989-5	204989-4	204989-4	204989-3	204989-2	204989-2	192
10	Hanger	42396A-4	42396A-8	42396A-7	42396A-11	42396A-5	42396A-9	190
11	Transmission Line Support	Support Angle/Threaded Rod Kit						191, 297
12	Waveguide Boot	48939-37	48939-52	48939-63	48939-77	48939-90	48939-127	193
13	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	193
14	Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186, 187
15	Pressure Window	55001-229	55001-137	55001-137	55001-112	55001-90	55220-75	204, 205
16	90° Elbow, E Plane	55402-229	55402-137	55402-137	55402-112	55402-90	55221-75	204, 205
	H Plane	55403-229	55403-137	55403-137	55403-112	55403-90	55403-75	204, 205
	Typical Antenna System Peak VSWR (R. L., dB)	1.12 (24.9)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.09 (27.3)	1.11 (25.7)	

*Specify number of openings.

Transmission Line Components – Dual-Band System

Item No.	Description	3.7-4.2 and 5.925-6.425 GHz	3.58-4.2 and 6.425-7.125 GHz	5.925-6.425 and 10.7-11.7 GHz	See Pages
	Antenna Type	SHX10C1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC212	WC281	WC281	
1	Taper Transition	—	202559	69271 and 205137	198
2	Swivel Flange Adaptor	69585-18	—	—	198
4	4-Port Combining Network	205572	201759	205136	198
	Elliptical Waveguide System	Same as Items 7-16 in Single-Band System			
5	Network Drain	48001-2	48001-2	48001-2	198
	Typical Antenna System Peak VSWR (R.L., dB), Low Band	1.13 (24.3)	1.12 (24.9)	1.10 (26.4)	
	High Band	1.11 (25.7)	1.10 (26.4)	1.09 (27.3)	

System Components

Description	Type Number	See Pages
Antenna Equipment		
Antenna	SHX10B1 or SHX10C1	88-91
Antenna Shipping Skid	96000	89
Antenna Mount	PM10A, TMP10A or TMB10A	90
Antenna Adjustment Kit	204527	90
Ice Shield	49158	90
Top and Front Access Kit	48760	91
Upper Access Ring Platform	48973	91
Lower Access Ring Platform	48974	91
Side Ladder	48971	91
Ladder Guide	49209	91
Repair Kit, Antenna and Radome	48990	91
Waveguide Support Platform	349044-1	91
Pressurization Equipment		
Dehydrator	48921	280
Pressurization Manifold	48094	280
Pressure Relief Kit	43849	90

Tower

Tower		286-300
Antenna Support Pipe	TACS Series	296
Waveguide Supports	TACW Series	297
Waveguide Bridge	TACB Series	297
Ladder/Stepbolts	TACC Series	296
Safety Climbing Device	TACC Series	296
Work/Rest Platform		298
Light Kit		299
Other tower options and accessories		296-299

Equipment Shelters

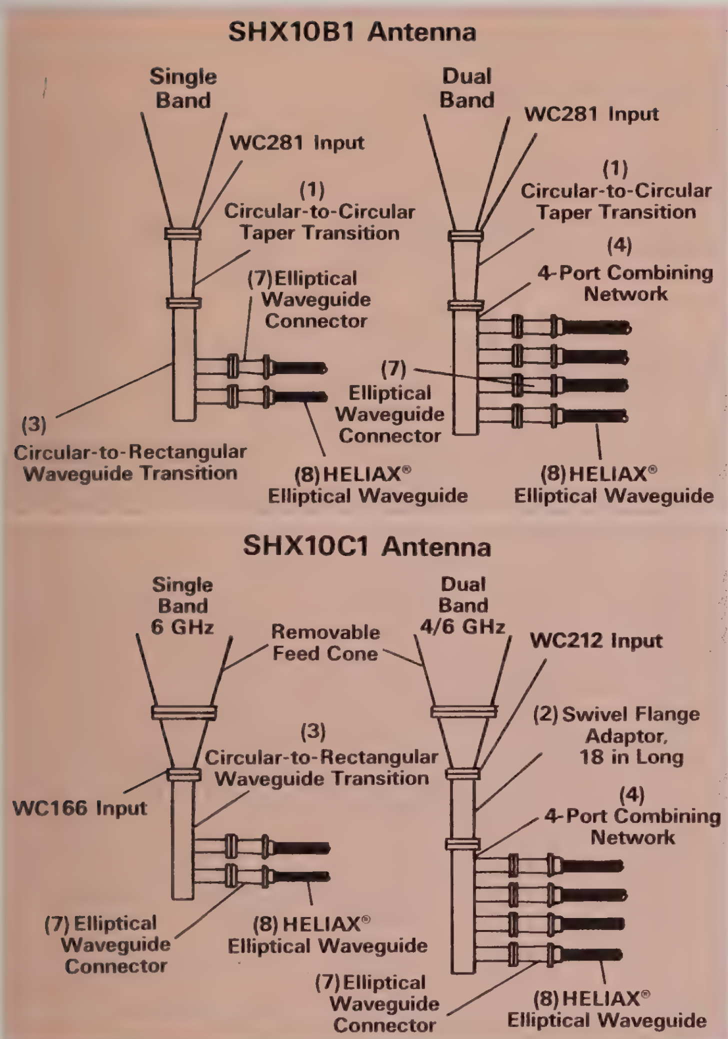
PLASTIDOME®	GES Series	302-306
Concrete	FCS Series	307-311
Structural Options		305, 310
Door Options		305, 310
Basic Electrical System		305, 310
Optional Electrical Equipment		306, 311
Environmental Control Equipment		306, 311

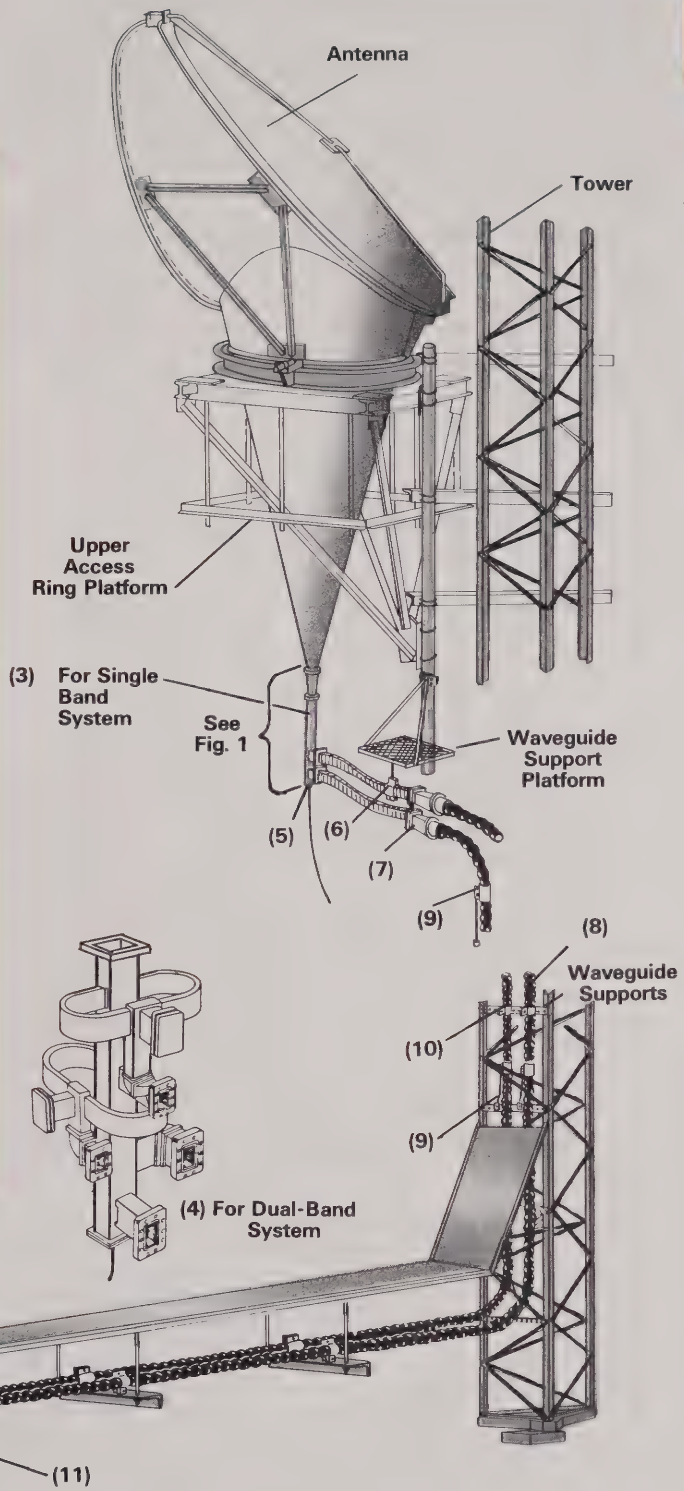
Engineering, Program Management and Field Services

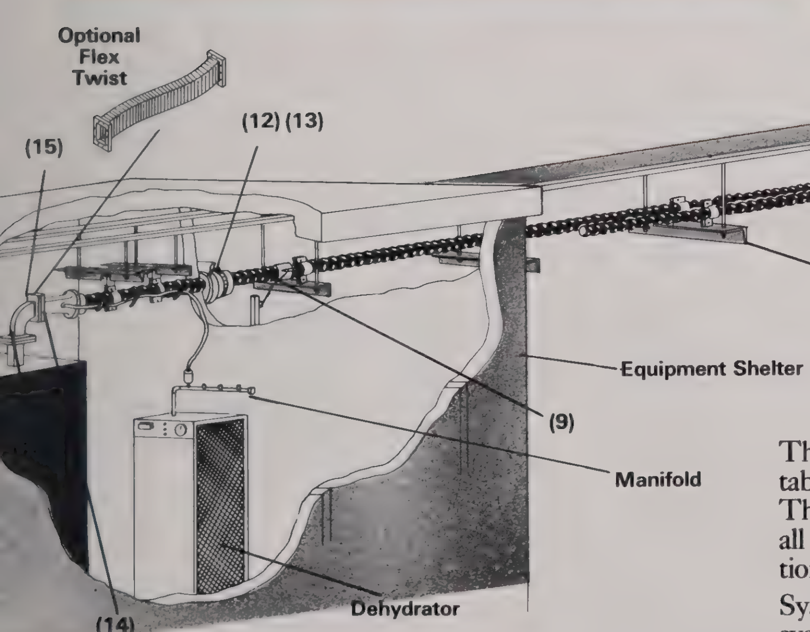
System Design Assistance	43-48
Program Management	43-48
Foundations/Civil	43-48
Freight	43-48
Delivery and Assembly	43-48
Installation	43-48
Path Alignment	43-48
System Testing	43-48

The typical horn-reflector antenna systems described below are examples only, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information and alternate components.

Figure 1







The typical antenna system peak VSWR's listed in the tables are measured at the pressure window (item 15). The antenna, 150 ft (45 m) of elliptical waveguide and all waveguide components, except the optional flex sec tion and elbow, are included.

Systems using circular waveguide and various support systems are described on pages 18-21.

System Using Spring/Sliding Hanger Support System

The typical horn-reflector antenna systems described below are examples only, not complete product listings.

A system using circular waveguide and a support system that is compatible with Bell System standard practices is described on pages 20-21.

The typical system peak VSWR's are measured at the pressure window (item 21). The antenna, 300 ft (91 m) of circular waveguide, 25 ft (8 m) of elliptical waveguide and all other components, except the elbow, are included.

For information on engineering, program management and field service, see pages 43-48.

Transmission Line System Components – Single-Band System

Item No.	Description	3.7 to 4.2 GHz	5.925 to 6.425 GHz	6.425 to 7.125 GHz	7.725 to 8.275 GHz	10.7 to 11.7 GHz	12.7 to 13.2 GHz	See Pages
	Antenna Type	SHX10B1	SHX10C1	SHX10B1	SHX10B1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC281	WC166	WC281	WC281	WC281	WC281	
	Circular Waveguide Type	WC269	WC166	WC166	WC166	WC166	WC109	196-201
1	Circular-to-Circular Taper Transition	69273	—	69271	69271	69271	69269	198
2	Mode Filter	—	—	—	—	69910	—	199
3	2 ft Section with Swivel	65456-24	69021-24	69021-24	69021-24	—	54345-24	196
4	Straight Section, 20 ft	69269-240	49608-240	49608-240	49608-240	49608-240	54346-240	196
	Straight Section, Special Length	69269*	49608*	49608*	40608*	49608*	54346*	196
5	Rigid Hanger†	19007A-269	69932	69932	69932	69932	19007A-109	201
6	Sliding Hanger	—	69933	69933	69933	69933	19008A-109	201
7	Spring/Sliding Hanger	19009A-269	69934	69934	69934	69934	19009A-109	201
8	Axial Ratio Compensator	64271	57568	57568	57568	57568	54348	199
10	Dual Pol. Circ.-to-Rect. Transition	64270A	62866A-1	64147A-1	64703A-1	69383	68998	197
11	Network Drain	48001	48001	48001	48001	48001	48001	198
12	Flex Twist (optional)	55421-24	55415-24	55415-24	55413-24	55411-24	51747-24	204, 205
	and Hanger	66412-229	66412-137	66412-137	—	66412-90	—	207
13	EW Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186, 187
14	Elliptical Waveguide	EWP37	EWP52	EWP63	EWP77	EWP90	EWP127A	180-194
15	EW Sliding Support	200970	200970	200970	200970	200970	200970	201
16	EW Hanger	42396A-4	42396A-8	42396A-7	42396A-7	42396A-5	42396A-9	190
17	Transmission Line Support	Support Angle/Threaded Rod Kit						191, 297
18	EW Grounding Kit	204989-5	204989-4	204989-4	204989-3	204989-2	204989-2	192
19	Waveguide Boot	48939-37	48939-52	48939-63	48939-77	48939-90	48939-127	193
	Feed-Thru Plate	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	193
20	EW Connector	137DET	252DET	163DET	177DET	190DET	1127DCT	186, 187
21	Pressure Window	55001-229	55001-137	55001-137	55001-112	55001-90	55000-75	204, 205
22	90° Elbow, E Plane	55402-229	55402-137	55402-137	55402-112	55402-90	55220-75	204, 205
	H Plane	55403-229	55403-137	55403-137	55403-112	55403-90	55221-75	
	Typical Antenna System Peak VSWR (R. L., dB)	1.11 (25.7)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.11 (25.7)	

*Specify length in inches or mm.
**Number of ports.

† Rigid hanger used only during installation. It is replaced with spring/sliding hanger after waveguide is in place. See page 201 for recommended hanger spacing.

Transmission Line System Components – Dual-Band System

Item No.	Description	3.7-4.2 and 5.925-6.425 GHz	3.58-4.2 and 6.425-7.125 GHz	5.925-6.425 and 10.7-11.7 GHz	See Pages
	Antenna Type	SHX10C1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC212	WC281	WC281	
	Circular Waveguide Type	WC269	WC269	WC166	196-201
1	Circular to Circular Taper Transition	69492	69273	69271	198
2	Mode Filter	—	69909	69910	199
3	2 ft Section with Swivel	65456-24	—	—	196
4	Straight Section, 20 ft	69269-240	69269-240	49608-240	196
	Straight Section, Special Length	69269*	69269*	49608*	196
5	Rigid Hanger†	19007A-269	19007A-269	69932	201
6	Sliding Hanger	—	—	69933	201
7	Spring/Sliding Hanger	19009A-269	19009A-269	69934	201
8	Axial Ratio Compensator	64271	64271	57568	199
9	Taper Transition	69492	69273 and 202559	205137	198
11	Network Drain	48001	48001	48001	198
23	4-Port Combining Network	205572	201759A	205136	198
24	Restrainer	49532-2	49532-4	49532-3	198
	Elliptical Waveguide System	Same as Items 12-20 in Single-Band Table			
	Typical Antenna System Peak VSWR (R.L., dB), Low Band	1.15 (23.1)	1.14 (23.7)	1.12 (24.9)	
	High Band	1.13 (24.3)	1.12 (24.9)	1.11 (25.7)	

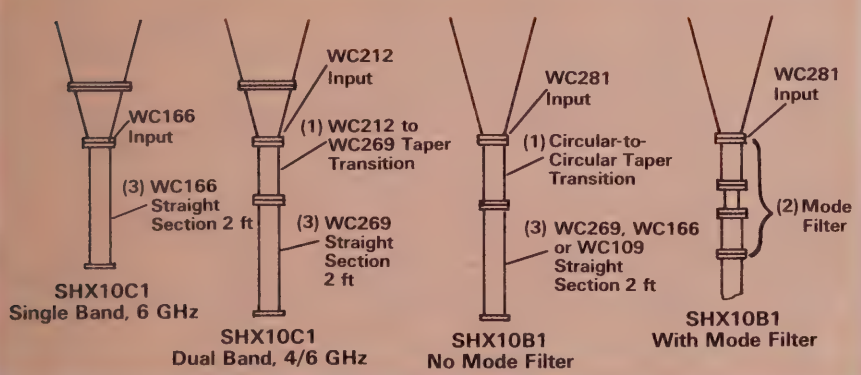
*Specify length in inches or mm.

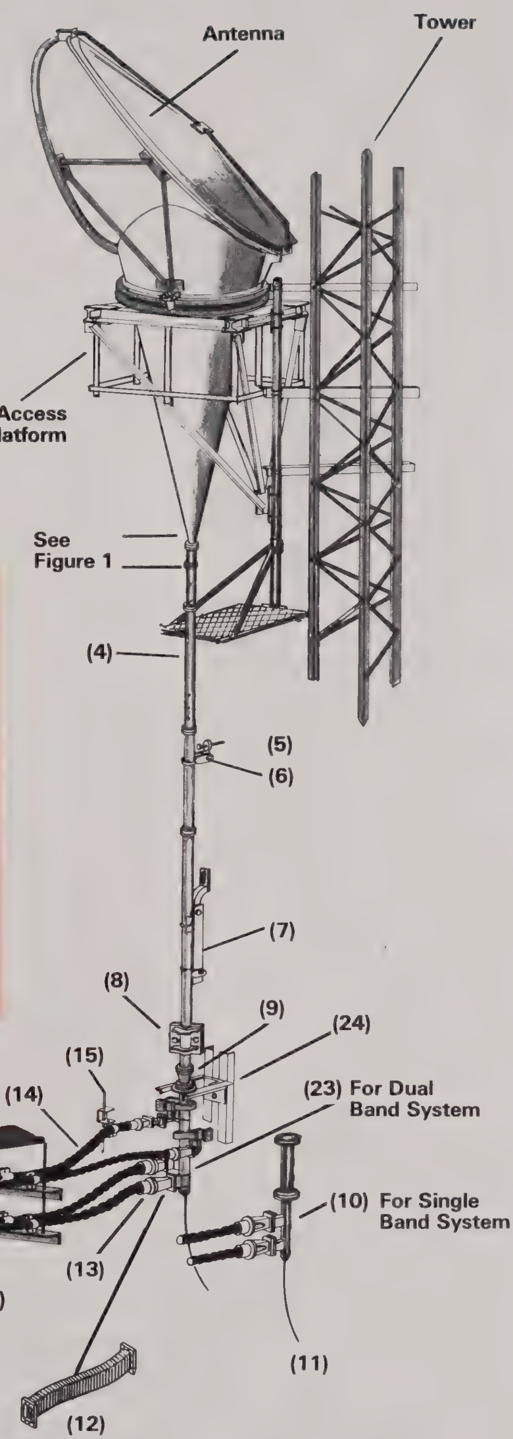
† Rigid hanger used only during installation. It is replaced with spring/sliding hanger after waveguide is in place. See page 201 for recommended hanger spacing.

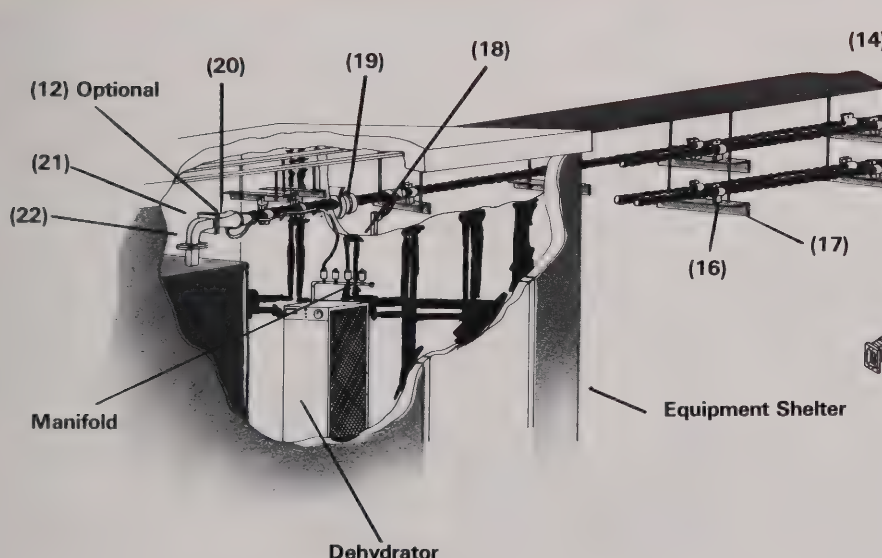
System Components

Description	Type Number	See Pages
Antenna Equipment		
Antenna	SHX10B1 or SHX10C1	88-91
Antenna Shipping Skid	96000	89
Antenna Mount	PM10A, TMP10A or TMB10A	90
Antenna Accessories		90, 91
Pressurization Equipment		
Dehydrator	48921	280
Pressurization Manifold	48094	280
Pressure Relief Kit	43849	90
Tower		
Tower, guyed or self-supporting		286-300
Tower options and accessories		296-299
Equipment Shelters		
PLASTIDOME®	GES Series	302-306
Concrete	FCS Series	307-311
Shelter Options		305, 306, 310, 311

Figure 1







System Using KS Compatible Support System

The waveguide system illustrated on the right is for use with the SHX® super high performance antenna. In this system, the weight of the circular waveguide run is supported by a mounting plate ("milkstool") located beneath the antenna input flange. In some cases, the plate is fixed by supports to the tower, in which case a WC281 flex is used to connect the circular waveguide to the horn antenna input flange. Recent practice has been to use a rigid circular waveguide section between the plate and the input flange. In this case, the plate is supported from the antenna mounting frame by thermal compensating

Transmission Line System Components – Single-Band System

Item No.	Description	3.7 to 4.2 GHz	5.925 to 6.425 GHz	5.925 to 6.425 GHz	6.425 to 7.125 GHz	6.425 to 7.125 GHz	10.7 to 11.7 GHz	See Pages
	Antenna Type	SHX10B1	SHX10C1	SHX10C1	SHX10B1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC281	WC166	WC166	WC281	WC281	WC281	
	Waveguide Type	WC281	WC281	WC166	WC281	WC166	WC166	
	Rectangular Waveguide Flanges	CPR229G	CPR159G	CPR159G	CPR137G	CPR137G	CPR90G	
1	Taper Transition (WC281 to WC166)	—	69271	—	—	69271	69271	198
2	Mode Filter	—	—	—	69908	—	69910	199
3	Straight Section, Fixed/Swivel flanges (length)†	48613A-96 (96 in)	48613A-78 (78 in)	69021-96 (96 in)	48613A-54 (54 in)	69021-78 (78 in)	69021-54 (54 in)	196
4	Waveguide Support	48976	48976	48976	48976	48976	48976	91
5	Support Plate	48605	48605	49013	48605	49013	49013	91
6	Wilson Bolt Assembly	48606	48606	48606	48606	48606	48606	91
7	Straight Section, 12 ft, 6-1/4 in							
	Fixed Flanges Both Ends	48600A-1	48600A-1	68573-166	48600A-1	68573-166	68573-166	196
	Fixed/Swivel Flanges**	48600A-2	48600A-2	68574-166	48600A-2	68574-166	68574-166	196
	Straight Section 12 ft 6 in							
	Fixed Flanges Both Ends	49607-150	49607-150	49608-150	49607-150	49608-150	49608-150	196
	Fixed/Swivel Flanges**	48613A-150	48613A-150	69021-150	48613A-150	69021-150	69021-150	196
8	Sliding Restrainer							
	18 in (460 mm)	48602	48602	49008	48602	49008	49008	200
	30 in (760 mm)	48603	48603	49009	48603	49009	49009	200
9	Axial Ratio Compensator	48609	48609	57568	48609	57568	57568	199
10	Straight Section (specify length)							
	Fixed Flanges Both Ends	48613A	48613A	49608	48613A	49608	49608	196
	Fixed/Swivel Flanges	49607	49607	69021	49607	69021	69021	196
11	Sliding Restrainer, Bottom	48604	48604	49010	48604	49010	49010	200
12	Taper Transition (WC281 to WC166)	—	69271	—	69271	—	—	198
13	Dual Pol. Circ. to Rect. Transition	69385	64159A-1	64159A-1	64147A-1	64147A-1	69383	197
14	Optional Flex-Twist (2 ft)	55421-24	55417-24	55417-24	55415-24	55415-24	55411-24	204, 205
15	EW Connector	137DET	152DET	152DET	163DET	163DET	190DET	187
16	Elliptical Waveguide	EWP37	EWP52	EWP52	EWP63	EWP63	EWP90	180-194
17	EW Sliding Support	200970	200970	200970	200970	200970	200970	201
18	EW Hanger	42396A-4	42396A-8	42396A-8	42396A-7	42396A-7	42396A-5	190
19	Transmission Line Support			Support Angle/Threaded Rod Kit				191, 297
20	Grounding Kit	204989-5	204989-4	204989-4	204989-4	204989-4	204989-2	192
21	Waveguide Boot	48939-37	48939-52	48939-52	48939-63	48939-63	48939-90	193
21	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	193
22	EW Connector	137DET	152DET	152DET	163DET	163DET	190DET	186, 187
23	Pressure Window	55001-229	55001-159	55001-159	55001-137	55001-137	55001-90	204, 205
24	Network Drain	48001	48001	48001	48001	48001	48001	198
	Typical Antenna System Peak VSWR (R. L., dB)	1.11 (25.6)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	

*Specify number of openings.
**Replacement use only.

†Components between antenna input flange and waveguide support (item nos. 1, 2, and 3) should total 96 in (2438 mm).

Transmission Line System Components – Dual-Band System

Item No.	Description	3.7-4.2 and 5.925-6.425 GHz	3.58-4.2 and 6.425-7.125 GHz	5.925-6.425 and 10.7-11.7 GHz	See Pages
	Antenna Type	SHX10C1	SHX10B1	SHX10B1	88-91
	Antenna Flange Type	WC212	WC281	WC281	
	Circular Waveguide Type	WC281	WC281	WC166	196-201
1	Taper Transition	49545	—	—	198
2	Mode Filter	—	69908	69910	199
3-11	Circular Waveguide System		Same as Items 3-11 in Single-Band Table		
12	Taper Transition	49545	202559	205137	198
25	4-Port Combining Network	205572	201759A	205136	198
26	Network Drain	48001	48001	48001	198
14-22	Elliptical Waveguide System		Same as Items 14-22 in Single-Band Table		
	Typical Antenna System Peak VSWR (R.L., dB), Low Band	1.15 (23.1)	1.14 (23.7)	1.12 (24.9)	
	High Band	1.13 (24.3)	1.12 (24.9)	1.11 (25.7)	

rods. These rods allow for expansion and contraction without stressing the waveguide which would cause changes in system cross-polarization discrimination response. An alternate system using Andrew standard spring and sliding hangers is presented on pages 18 and 19.

Low VSWR premium waveguide components are recommended for use with SHX® super high performance antennas for long-haul or high channel density systems.

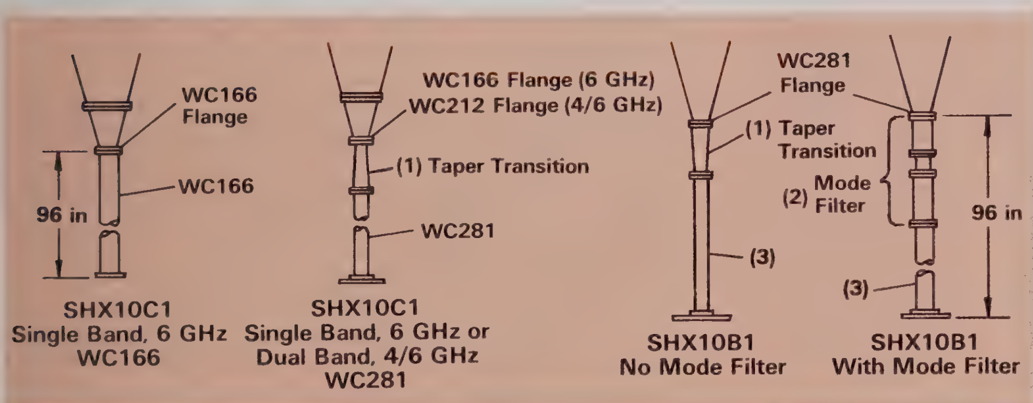
The typical antenna system peak VSWR, listed in the table, is measured at the pressure window (item 23). The system includes 300 feet of circular waveguide, 25 feet of elliptical waveguide, a Type SHX10B1 or SHX10C1 antenna and all of the waveguide components shown, except the optional elbow.

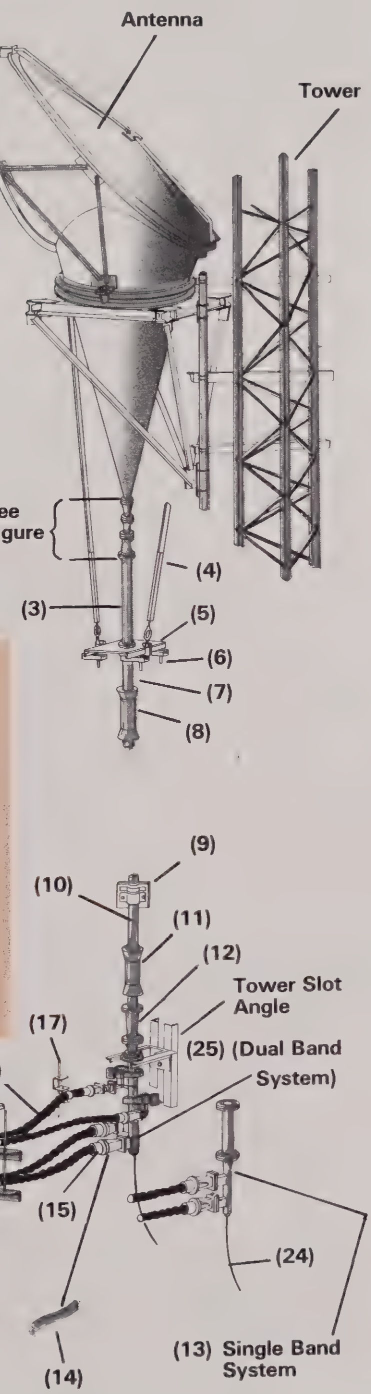
For information on engineering, program management and field services, see pages 43-48.

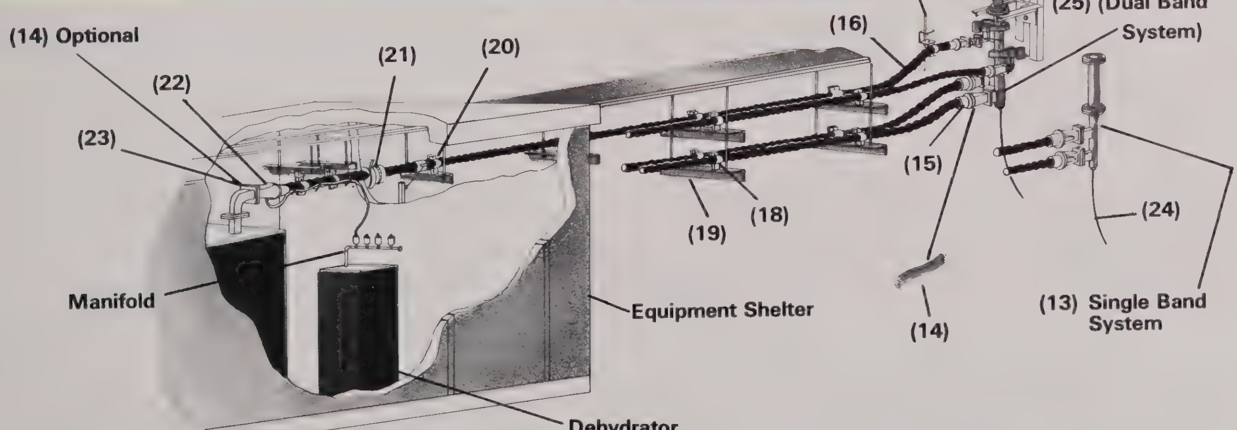
System Components

Description	Type Number	See Pages
Antenna Equipment		
Antenna	SHX10B1 or SHX10C1	88-91
Antenna Shipping Skid	96000	89
Antenna Mount	PM10A, TMP10A or TMB10A	90
Antenna Accessories		90, 91
Pressurization Equipment		
Dehydrator	48921	280
Pressurization Manifold	48094	280
Pressure Relief Kit	43849	90
Tower		
Tower, guyed or self-supporting		286-300
Tower options and accessories		296-299
Equipment Shelters		
PLASTIDOME®	GES Series	302-306
Concrete	FCS Series	307-311
Shelter Options		305, 311

Figure 1







Introduction

Andrew offers a comprehensive line of earth station antenna systems for satellite communication networks operating at Ka, Ku and C band frequencies. Included are earth station antennas, control systems, transmit and receive electronic components, transmission lines, pressurization equipment and equipment shelters.

Proper choice of system components is based on government regulations, frequency band, coordination requirements, satellite system utilization, signal quality requirements, site location, economics and project implementation parameters.

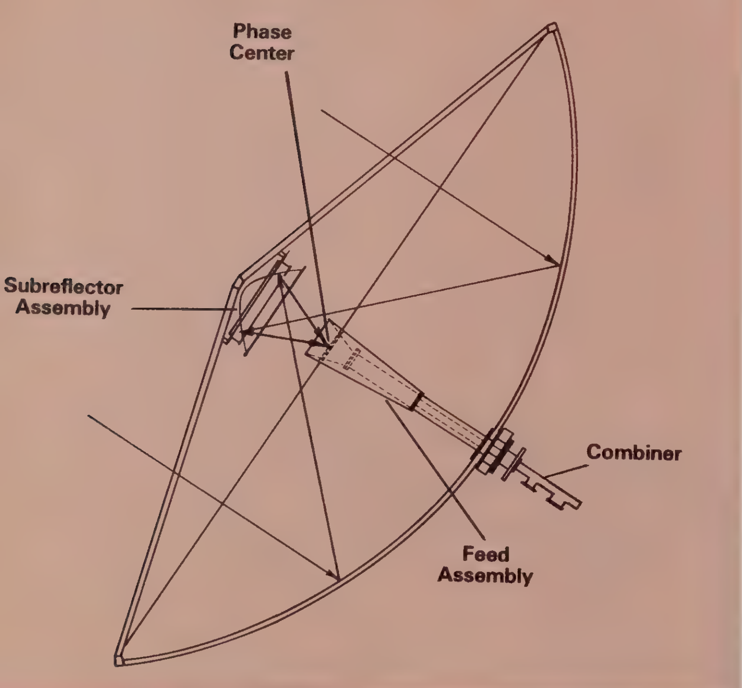
Earth Station Antennas

Andrew offers a complete line of high quality, performance oriented earth station antennas ideally suited to the requirements of the satellite communications market. All antennas and components are designed for optimum performance and reliability.

Andrew earth station antennas offer the following advantages:

Gregorian Optics incorporate a small subreflector which increases the antenna efficiency, thereby resulting in higher gain for a given antenna diameter. Higher gain permits the use of cost effective LNA and/or power amplifiers. The Gregorian subreflector is concave, instead of convex, so heating of the subreflector is unnecessary.

Gregorian Optics Feed System Using Circular Waveguide Feed



Circular Waveguide transmits the microwave signal from the feed horn to the combining network interface located inside the equipment enclosure. This method minimizes system gain losses and is far superior to conventional methods employed in antennas of cassegrain design. There is little or no interface waveguide required between the LNA and combining network. The result is a much higher G/T for a given antenna size.

4-Port Linear and Circular Combining Networks inherently include 85 dB transmit-to-receive isolation. This level of isolation permits their use without costly and performance degrading transmit reject filters and/or isolators. Combining network specifications are presented on page 126.

Guaranteed Near-In Pattern. The $\pm 7°$ region of the antenna radiation pattern is extremely important with satellite spacing of 2°. The U.S. FCC requires that the transmit pattern lie completely below the 29-25 log θ curve in the 1° to 7° region of the geostationary arc. The purchaser of a U.S. domestic transmit antenna should insist on an antenna that is guaranteed to meet this specification over the **entire** transmit frequency band. All Andrew antennas which are specified to be 2° compliant carry this **guarantee**.

The receive radiation pattern is also a critical parameter in the selection of an earth station antenna. A high level of adjacent satellite rejection is required to ensure adequate baseband performance. A thorough examination of the guaranteed receive pattern envelope is recommended to determine that the antenna is suitable for use with 2° satellite spacing.

It is highly recommended that the earth station antenna is pattern tested on site to be assured that the antenna, **as installed**, is compliant with the applicable regulations.

Guaranteed Wide Angle Pattern. The complete 180° pattern envelopes are typically used for frequency coordination purposes. Andrew pattern envelopes are based on satellite and 360° far-field range measurements of horizontal and vertical polarizations taken at the bottom, middle and top frequencies of the operating band. Andrew pattern envelopes represent the guaranteed envelope for all frequencies and polarizations. To be sure that a given antenna will function properly at a given site, it is necessary to coordinate using a **guaranteed** pattern envelope. Actual off-axis gain for a given frequency, polarization and angle, in most cases, will be better than indicated on the pattern envelope. For further information, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1197. Actual test range and satellite patterns are also available from Andrew on request.

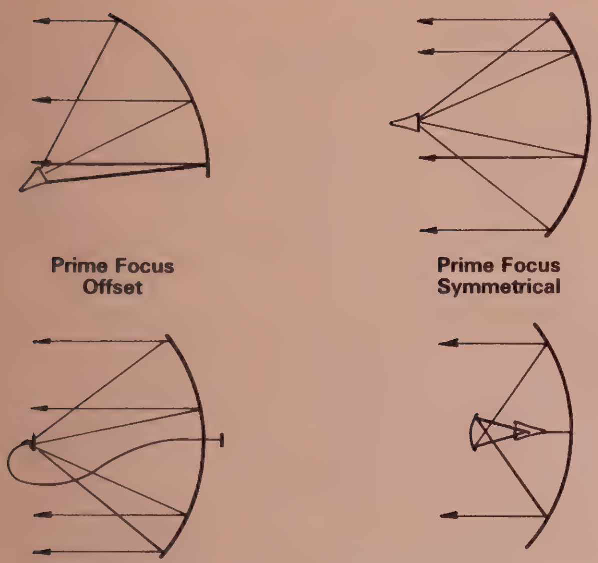
Feed Windows. All Andrew earth station antennas have feed windows constructed of Teflon®-coated glass fabric. This material exhibits hydrophobic properties and is environmentally resistant. Reliability and long life have been demonstrated over many years of use in Andrew's line of earth station and terrestrial microwave antennas.

Pointing/Positional Accuracy. Andrew motorized earth station antennas include resolver type angle encoders for extremely high position accuracy, repeatability and reliability. Positional accuracy is especially important for use with 2° spaced satellites. The resolver angle encoders permit cable runs up to 1000 feet (305 m) without per-

formance degradation or risk of noise induced errors. Generally, the on-axis cross polarization discrimination can be severely degraded if the antenna boresight is misaligned by more than 0.05°.

Feed Types. Various feed systems are used in the design of Andrew earth station antennas depending on size performance and cost trade-offs. Typical designs are illustrated below.

Feed Types Used in Andrew Earth Station Antennas



Transmission Lines. Andrew offers a complete line of transmission lines and components for IFL (interfacility link) satellite earth station applications. HELIAX® elliptical waveguide is available in long, continuous lengths for ease of system planning and installation. Rectangular waveguide components such as flex sections, rigid elbows and pressure windows are used for connections with the antenna and radio equipment. Special flex, flex-twist and pressure windows for high, medium and low power are offered for earth station applications on page 203.

HELIAX coaxial cables are offered in a variety of sizes and types. Cables and assemblies which are specially tested and selected for use in earth station applications are described on page 244.

Other IFL equipment available from Andrew includes completely pre-engineered kits for LNA to combining network interface, transmit reject filters and crossguide couplers. For information on any products not listed, contact your local Andrew Sales Office listed inside the back cover.

Transmission Lines	See Pages
HELIAX Elliptical Waveguides	180-194
Rigid Rectangular Waveguides	202-209
High Power Waveguide Components	203
HELIAX Coaxial Cables	210-257
Selected and Tested Cables	244

Earth Station Antenna Pressurization Equipment. Andrew offers a wide selection of highly reliable automatic and manual dehydrators and other low pressure system components for use in earth station antenna systems. Pressurization equipment is described on pages 277-285.

Criteria for Earth Station Antenna Selection

Technical Information

RF Analysis. Satellite system analysis is typically centered around the carrier-to-noise density ratio. The following technical information is presented to assist the system designer in the selection of optimum components for earth station antenna systems. For assistance with calculations, contact your local Andrew Sales Office listed inside the back cover.

C/N_o dB/Hz (downlink) $= -k + \text{EIRP} - \text{PL} + G/T$

Where:

C/N_o dB/Hz = Carrier-to-noise density (downlink path)

k (Boltzman's Constant) = 1.38×10^{-23} Joules/K
or −228.6 dBw/K/Hz

Typical Satellite Footprint

EIRP dBw = Satellite effective isotropic radiated power toward the earth. This information is provided by the satellite manufacturer in terms of dBw at given points on the earth. This is also known as the satellite "footprint".

In multicarrier operation, the EIRP value is substituted with EIRP/carrier. There is normally a backoff associated with multicarrier transponders to avoid high levels of intermodulation.

PL dB = Pathloss is the free-space dissipation in power density with distance. This reduction in power density is inversely proportional to the factor ($4 \pi r^2$).

In addition, pathloss is frequency dependent due to the directivity change for a given size antenna which is proportional to the wavelength.

$$PL = 185.0 + 10 \log (1-0.295 \cos Y \cos X) + 20 \log (\text{frequency in GHz}) \text{ where:}$$

Y = earth station latitude

X = difference in longitude of the satellite and earth terminal

G/T dB/K* = Earth Terminal Figure of Merit

G/T* = Net antenna receive gain − 10 log (system noise temperature)

*Assumes the transmission line loss is negligible compared to the LNA/LNC gain.

Where:

Net receive antenna gain = antenna gain − interface waveguide loss between combiner and LNA − mismatch loss

System noise temperature = LNA noise temperature + antenna noise temperature + VSWR noise configuration + interface waveguide noise

For antenna gain and noise temperature, see pages 96-126; other values can be determined from tables below.

Interface Waveguide Degradation

Interface Waveguide, Copper	Typical Loss Per Foot (L)	Noise Temperature Per Foot at 290 K**
WR229 Rigid (4 GHz)	0.008 dB	0.5 K
WR75 Rigid (12 GHz)	0.044 dB	2.9 K
Typ. WR229 Flex (4 GHz)	0.023 dB	1.5 K
Typ. WR75 Flex (12 GHz)	0.150 dB	10.1 K

**Interface waveguide noise is calculated from the formula:

$$\text{Noise} = 290 \text{ K} (L_{num} - 1)$$

Where: $L_{num} = 10^{\frac{L\,dB}{10}}$

VSWR Noise Contribution & Mismatch Loss
(Assumes LNA Input Isolator at 290 K)

VSWR	Mismatch Loss (dB)	Noise Contribution (K)
1.35	0.10	2.9
1.30	0.07	1.4
1.25	0.06	1.0
1.20	0.04	0.5

The actual carrier-to-noise ratio depends on the noise bandwidth utilized by the receive system.

$$C/N \text{ dB (downlink)} = -(-288.6) + EIRP - PL + G/T - 10 \log BW$$

or

$$= C/N_o - 10 \log BW$$

Where:

C/N dB = Carrier-to-noise ratio contribution from the downlink only.

BW = IF noise bandwidth of the receive equipment in hertz.

Examples: Typical noise bandwidth of a C-band broadcast quality receiver = 34 MHz (75.3 dB-Hz).

Typical noise bandwidth of a C-band commercial receiver = 30 MHz (74.7 dB-Hz).

The uplink carrier-to-noise is typically negligible compared to the downlink carrier-to-noise, but, depending on the system configuration, may contribute significantly to the noise budget.

$$C/N_o \text{ dB/Hz (uplink)} = SD + SG/T - 20 \log FREQ + 207.15$$

or

$$C/N \text{ dB (uplink)} = C/N_o \text{ dB/Hz} - 10 \log BW$$

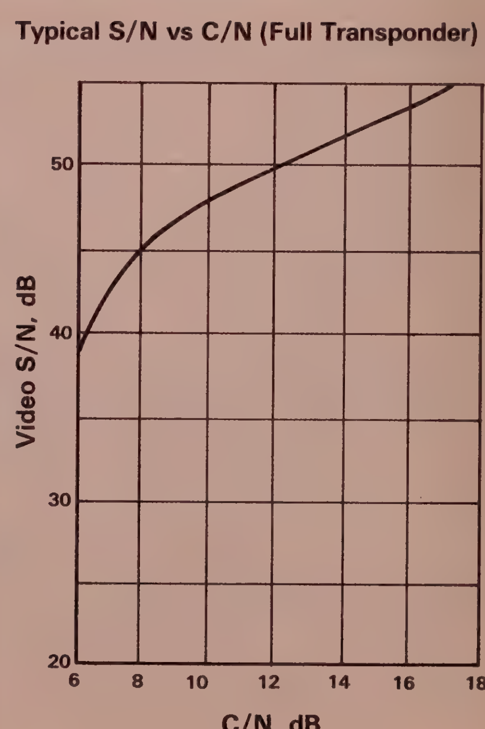
Where:

SD = Satellite saturation flux density. Saturation flux density is the power density required at the satellite receive antenna to obtain maximum power out of the satellite power amplifier. The information is given in terms of dBw/m^2 at given points from the earth by the satellite manufacturer.

SG/T = Satellite figure of merit. Figure of merit of the satellite from given points on the earth. This information is also given by the satellite manufacturer.

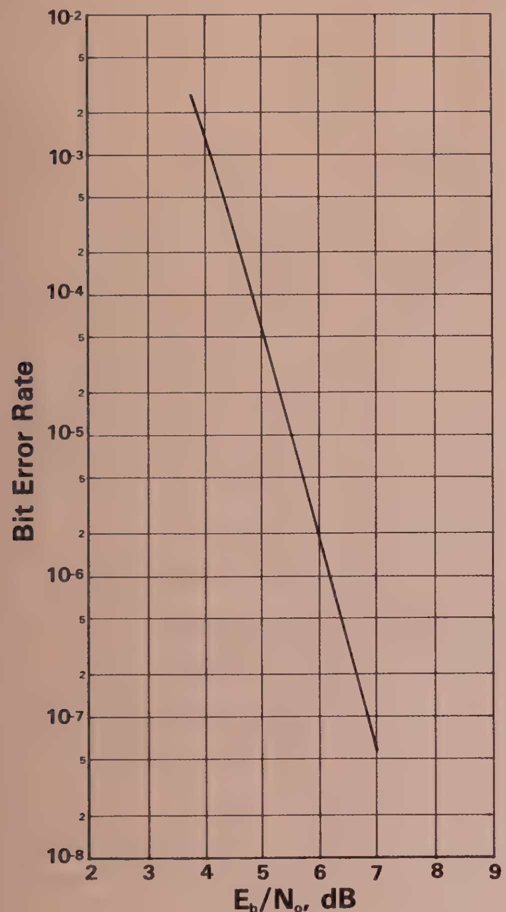
FREQ = Uplink frequency in hertz.

BW = IF noise bandwidth of receive equipment in hertz.



Typical Bit Error Rate vs. E_b/N_o

(Theoretical with 3/4 Forward Error Correction)



The final carrier-to-noise is that which is delivered to the demodulation equipment. This factor includes degradation from the uplink and downlink paths, terrestrial, adjacent satellite, cross polarized and adjacent transponder interference. In this type of analysis, it is assumed that interference is non-coherent. As stated previously, the downlink path normally dominates the circulation, especially in full transponder video operational.

$$C/N\ \text{Final dB} = 10 \log \left[\frac{1}{\frac{1}{10^{\frac{C/N\,(down)}{10}}} + \frac{1}{10^{\frac{C/N\,(up)}{10}}} + \frac{1}{10^{\frac{C/I\,(terr)}{10}}} + \frac{1}{10^{\frac{C/I\,(adj\,sat)}{10}}} + \frac{1}{10^{\frac{C/I\,(adj\,Xpo)}{10}}}} \right]$$

Where:

C/N (down) = Carrier-to-noise from downlink.

C/N (up) = Carrier-to-noise from uplink.

C/I (terr) = Carrier-to-interference from terrestrial microwave.

C/I (adj. sat) = Carrier-to-interference from the adjacent satellite.

C/I (adj. Xpo) = Carrier-to-interference from cross polarized transponders.

Analog Signal-To-Noise

In analog modulation equipment, signal-to-noise is typically used to define the system baseband performance.

Video Signal-to-Noise (luminance-to-rms weighted per CCIR)

$$S/N\ \text{dB} = C/N\ \text{Final} + 10 \log\left(\frac{IF}{2BB}\right) + 10 \log 3\left(\frac{MVD}{MBF}\right)^2 + 18.9\ \text{dB}$$

Where:

C/N Final = Carrier-to-noise fed to the demodulation equipment as calculated earlier.

IF = IF bandwidth in hertz.

BB = Baseband bandwidth in hertz.

MVD = Maximum video deviation in hertz.

MBF = Maximum baseband frequency in hertz.

Signal Channel Per Carrier (SCPC — Analog Modulation)

$$S/N\ \text{dB} = C/N + 20 \log\left(\frac{MSD}{MBF}\right)^2 + 10 \log\left(\frac{IF}{BB}\right) + 10.5 + \text{Compandor Improvement Factor (dependent on manufacturer)}$$

Where:

MSD = Maximum subcarrier deviation.

Digital Bit Error Rate

In digital modulation schemes, bit error rate is used to determine final baseband performance of a given communication system.

$$E_b/N_o\ (\text{dB}) = C/N + 10 \log\left(\frac{TR}{IF}\right)$$

Where:

E_b/N_o = Energy bit per unit bandwidth.

C/N Final = Final carrier-to-noise fed to demodulation equipment.

TR= Total transmission rate in bits per second (includes forward error correction, if used).

IF = Receive bandwidth in hertz.

or

$$E_b/N_o = \frac{C}{N_o} + 10 \log \frac{1}{TR}$$

The final bit error rate will be determined by modem performance and forward error correction rate. This is very similar to the receiver performance vs. carrier-to-noise graph.

As can be seen in the modem characteristics curve, forward error correction improves the BER compared to E_b/N_o at the expense of bandwidth. For a given application, a trade-off study is typically done to determine the most economical components to use for a given application.

Selection of Power Amplifier

To determine the high power amplifier size, it is first necessary to calculate the uplink power requirement. This can be determined by:

$$\text{Power (dBw)} = \text{SD} + \text{SL} - \text{TBO} - \text{GA}$$

Where:

Power = Power required at combiner (OMT) flange.

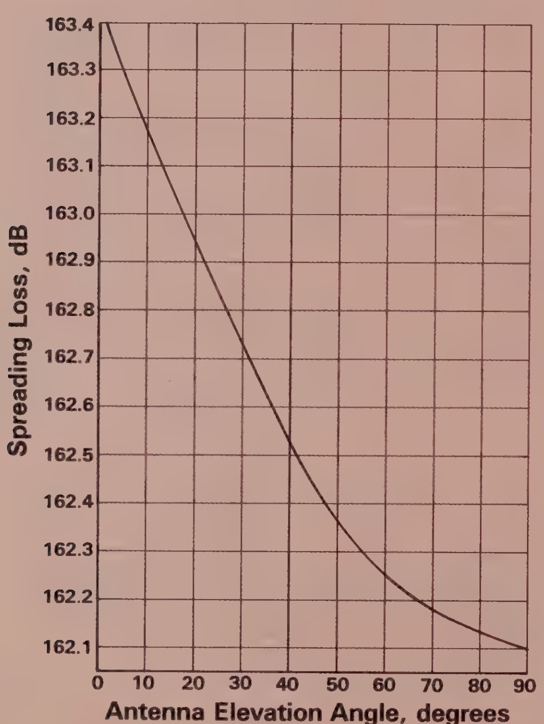
SD = Satellite Saturation Flux Density (see page 24).

SL = Spreading loss. Loss in power density due to a given power covering an ever increasing area as it travels. This variable is inversely proportional to ($4 \pi r^2$). There is no frequency factor in this equation.

Spreading Loss (dB) = 10 log ($4 \pi r^2$).

Where "r" is the distance between the satellite and the earth station antenna in metres.

Spreading Loss vs. Antenna Elevation Angle



TBO = Transmitter back-off necessary for multicarrier operation. The transmitter back-off is greater than the satellite transponder back-off. This factor is zero for saturated transponder operation.

GA = Gain of the antenna at the particular operation frequency.

The power amplifier size can be determined by:

$$\text{PA (dBw)} = \text{Power} + \text{TLA} + \text{DL}$$

Where:

Power (dBw) = Power required at combiner (OMT) flange.

TLA = Transmission line attenuation (see table below).

DL = High power diplexer loss (depends on diplexer type).

Transmission Line, Copper	Attenuation/100 ft (100 m)
EW52, EWP52	1.2 (3.9) dB at 6.175 GHz
WR159	1.4 (4.6) dB at 6.175 GHz
WR137	1.9 (6.2) dB at 6.175 GHz
EW132, EWP132	4.9 (16.1) dB at 14.25 GHz
WR75	3.9 (12.8) dB at 14.25 GHz

$$\text{HPA (watts)} = 10^{\frac{\text{HPA (dBw)}}{10}}$$

Selection of Pressurization Equipment

Earth station antennas normally have large feed horn window aperture areas. Therefore, low pressure equipment (typically less than 1 lb/in^2) is used. Pressurization is required to prevent performance degradation due to condensation in the feeds and transmission line.

See pages 277-283 for pressurization system selection. Typically, a 65630B low pressure dehydrator is used for R/O applications which require pressurization and the 39210 ESA pressurization kit is used for R/T applications. The 39210 kit consists of a 1934C, a low pressure regulating tank and a stand. 39210-2 is identical to the 39210 but used with 220V/50 Hz primary power.

Selection of Receive Transmission Line

Allowable receive transmission line attenuation can be determined from the formula:

$$\text{Power level into the demodulation equipment dBm} = \text{EIRP} - \text{PL} + \text{GA} + \text{GLNA} - \text{TLA} - \text{PDL}.$$

Where:

EIRP = Power radiated from the satellite in the direction of the earth station. This variable is typically given in terms of dBw but should be in terms of dBm (dBm = dBw + 30). If the earth station is used in a multicarrier transponder, dBm/carrier must be used.

PL = Pathloss – see page 24 for explanation.

GA = Gain of the antenna at the frequency of use.

GLNA = Gain of the LNA.

TLA = Transmission line attenuation. (See attenuation vs. frequency of various coaxial cables or waveguide on pages 178, 179 and 214-218.)

PDL = Power divider loss; assume 4 dB for 2 way, 7 dB for 4 way and 10 dB for 8 way.

Example:

Assume a requirement for a versatile Ku-band video uplink/downlink antenna located in Chicago, Illinois,

(longitude 87° West, latitude 42° North), the distance between the equipment shelter and the antenna is 100 feet.

Specifications:

1. System must function with all U.S. domestic Ku-band satellites.

2. The package will utilize both full and partial (24 MHz) transponder operation.

3. Video signal-to-noise (luminance weighted) must be 54 dB, worst case, under clear sky conditions.

4. The maximum video deviation will be 9 MHz with partial transponder operation.

5. The LNA/LNC will be single thread (non-redundant).

Note: The minimum size for a full transponder licensable unlink antenna is required to be 5 metres in aperture diameter or greater. A technical analysis must be included with license application for a smaller antenna.

Step 1: The minimum size of the antenna will probably be set by the 54 dB signal-to-noise using the weakest satellite EIRP in a partial transponder format. Assume the weakest U.S. domestic satellite EIRP in the Chicago area is at 127° West orbital longitude with an EIRP of 45 dBw.

A) Calculate the carrier-to-noise necessary for a 54 dB video signal-to-noise; see the equation given on page 24.

$$\text{S/N dB} = \text{C/N Final} + 10 \log \left(\frac{\text{IF}}{2\text{BB}}\right) + 10 \log 3 \left(\frac{\text{MVD}}{\text{MBF}}\right)^2 + 18.9$$

$$54 \text{ dB} = \text{C/N Final} + 4.5 + 11.4 + 18.9$$

$$54 \text{ dB} = \text{C/N Final} + 34.8$$

$$\text{C/N Final} = 19.2 \text{ dB}$$

In this example, for simplicity, assume the C/N (downlink) completely dominates the link such that C/N Final = C/N (downlink).

B) Calculate the G/T necessary for a C/N (downlink) of 19.2 dB from the equation given on page 24.

$$\text{C/N dB (downlink)} = -(-228.6) + \text{EIRP} - \text{PL} + \text{G/T} - 10 \log \text{BW}$$

EIRP = 45 dBw − 6 dB (back-off for partial transponder operation) = 39 dBw

PL = 185.0 + 10 log (1-0.295 COS Y COS X) + log (frequency in GHz)
= 185.0 + 10 log (0.832) + 20 log (12.0 GHz)
= 205.7 dB

BW = 24 x 10^6 Hz

$$19.2 \text{ dB} = -(-228.6) + 39 - 205.7 + \text{G/T} - 10 \log (24 \times 10^6)$$

$$19.2 \text{ dB} = \text{G/T} - 11.9$$

$$\text{G/T} = 31.1 \text{ dB/K}$$

C) Calculate the antenna size and LNA/LNC noise temperature for a G/T of 31.1 dB/K from the equation and tables on page 24. Assume a 5.6 m antenna will be used to meet 5 m requirement.

G/T = Net Antenna Gain − 10 log (system noise temperature)

Net Antenna Gain = Antenna gain − interface waveguide loss − mismatch loss

Net Antenna Gain = 55.5 − 0.15 dB (transmit reject filter) − 0.07 dB
= 55.3 dB/K

System Noise Temperature = LNA/LNC noise temperature + antenna noise temperature + VSWR noise contribution + interface waveguide noise

System Noise Temperature = 180 K + 45 K + 1.4 K + 10.1 K
= 240.5 K

G/T = 55.3 dB − 10 log (240.5 K)
= 31.4 dB/K

The required G/T is exceeded by 0.3 dB.

Step 2. Verify that the 5.6 metre exhibits enough transmit gain to use an economical high power amplifier. The equations and tables on page 26 are used in this calculation. Assume the high power amplifier is used in single carrier operation. EW132 waveguide is used for transmission line.

Power (dBw) = SD + SL + TBO − GA

Power (dBw) = −80 dBw/m² + 162.5 dB + 0.0 dB − 59.7 dB
= 22.8 dBw

PA (dBw) = Power + TLA + DL
= 22.8 dBw/m² + 4.9 dB + 0.0 dB
= 27.7 dBw

$$\text{HPA} = 10^{\frac{\text{PA (dBw)}}{10}}$$

$$= 10^{\frac{27.7 \text{ (dBw)}}{10}}$$

= 588.8 watts

A 600 watt amplifier can be used.

Step 3. Automatic dehydrator kit Type 39210 is recommended.

Step 4. Determine the proper receive transmission line by calculating the maximum attenuation of the interfacility link. The minimum receive level into a typical video receiver is −60 dBm, the LNC output frequency is nominally 1 GHz and the package uses a 8-way power divider.

Power level into demodulation equipment, dBm = EIRP − PL + GA + GLNA − TLA − PDC

(EIRP, PL, GA were given earlier.)

GLNA = 50 dB

−60 dBm (39 dBw + 30) dBm − 205.8 dB + 55.3 dB + 50 dB − TLA − 10 dB

−60 dBm = −TLA − 41.5 dBm

TLA = 18.5 dB (maximum attenuation of receive transmission line at 1 GHz)

Note: The loss of the transmission line should be less than 10% of the LNA/LNC gain to have a negligible effect on the G/T.

1/2" foam-dielectric cable is suitable as the receive transmission line.

Typical components used in C-Band satellite communication earth station systems are tabulated below. Typical hub interface components and cross-axis kits are illustrated on page 29.

Other System Components (See pages):

Receivers	132
Equipment Shelters	301-311
Pressurization Equipment	277-285

C-Band Antenna System Components

Earth Station Antennas	12m	9m	7.3m	4.5m
LNA Interface				
R/O Nonredundant FET LNAs/LNCs, 2-port	*	201100-15	201100-703	Included
R/T Nonredundant FET LNAs/LNCs, 2-port	*	201100-4†	201100-705†	*
R/O Redundant FET LNAs/LNCs, 2-port	*	*	*	*
R/T Redundant FET LNAs/LNCs, 2-port	*	201100-4†	201100-705†	*
Transmit Reject Filter	47111-3	47111-3	47111-3	47111-3
Transmit Waveguide Cross Axis Kit				
Azimuth and Elevation, One Run	*	201146A	201437A	*
Two Runs	*	201146A-2	201437A-2	—
Remote Motor Control Cable				
Cable Type Number	385503	200775	200775	200775
Maximum Length, ft (m)	4000 (1220)	1000 (305)	1000 (305)	1000 (305)
Earth Station Antenna Controller – Rack Mount – See Page 127				
120V, 60 Hz and 220V, 50 Hz	111030-3	AAC100	AAC100	AAC100

*Contact your local Andrew Sales Office listed inside the back cover.

†Requires transmit reject filter 6.35 inches long (Type 47111).

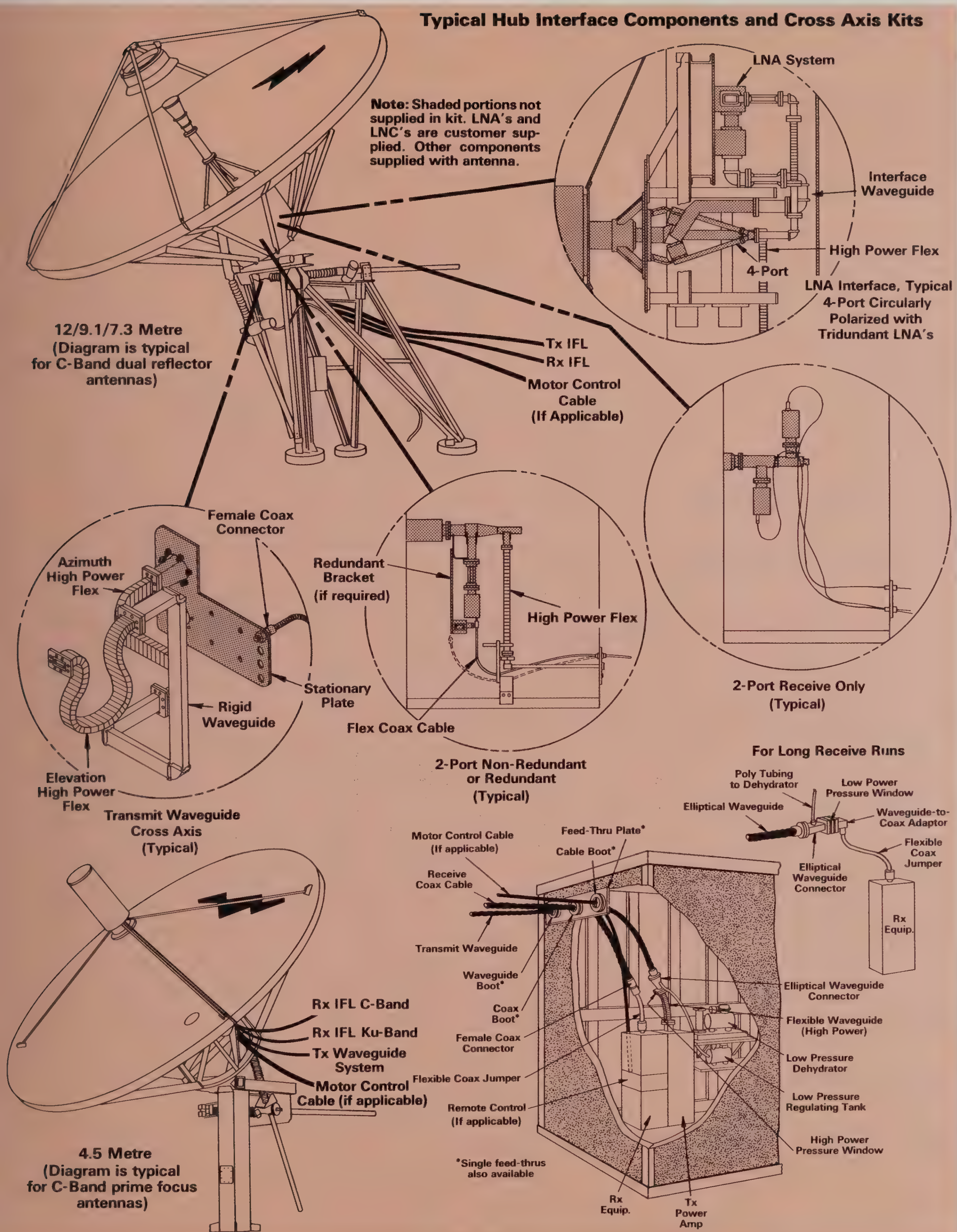
Transmission Line System Components

	5.925 to 6.425 GHz	5.850 to 6.425 GHz	3.7 to 4.2 GHz	3.625 to 4.2 GHz	0.94 to 1.425 GHz	See Pages
HELIAX® Elliptical Waveguide – See pages 190-194 for Accessories						
Waveguide Flanges	CPR137G	CPR137G	CPR229G	CPR229G	—	208
Elliptical Waveguide	EW52	EW52	EW37‡	EW37‡	—	180-184
Connector	252DE	252DE	137DE	137DE	—	186-189
Rigid Rectangular Waveguide Components – See pages 202-209 for Additional Components						
Waveguide Flanges	CPR137G	CPR137G	CPR229G	CPR229G	—	208
Flex-Twist, High Power, 3300 W	162047-(†)	162047-(†)	—	—	—	203
Flex-Twist, Low Power	—	—	55421-(†)	55421-(†)	—	204
Flex (No Twist), High Power, 5300 W	162048-(†)	162048-(†)	—	—	—	203
Pressure Window, High Power, 10 kW	202378-2	202378-2	—	—	—	203
Pressure Window, High Power, 1 kW	202378	202378	—	—	—	203
Pressure Window, Low Power, 25 W	55001-137	55001-137	55001-229	55001-229	—	204
Step Twist, 90°	65230-137-3	65230-137-17	65230-229	65230-229	—	204
Termination Load	62901-137	62901-137	62901-229	62901-229	—	199
Transmit Reject Filter	47111	47111-2	—	—	—	—
Crossguide Coupler, 50 dB	47112	47112-2	—	—	—	—
HELIAX Coaxial Cable – See pages 252-256 for Accessories						
7/8" Air Dielectric	—	—	25831-2	25831-2	25817-34	—
1/2" Air Dielectric	—	—	207032-2	207032-2	207032-1	—
Connector, 7/8" Air, N Jack	—	—	75AN	75AN	75AN	—
Connector, 1/2" Air, N Jack	—	—	74AN	74AN	74AN	—
Jumper Cable Assembly, 1/2" Supeflexible, Type N Plug/Type N Plug	48369A	48369A	48367A	48367A	48363A	—
7/8" Foam Dielectric	—	—	42150B-39	42150B-39	—	—
1/2" Foam Dielectric	43818-6	43818-6	43818-5	43818-5	43818-42	—
Connector, 7/8" Foam, N Jack	—	—	L45N	L45N	—	—
Connector, 1/2" Foam, N Jack	L44N	L44N	L44N	L44N	L44N	—

‡EW37 used for long runs. EW34 has lowest attenuation for very long runs.

†Specify length in inches, -12 (1 ft), -24 (2 ft) or -36 (3 ft).

Typical Hub Interface Components and Cross Axis Kits



Earth Stations, Ku-Band Systems

Typical components used in Ku-Band satellite communication earth station systems are tabulated below. Typical hub interface components and cross-axis kits are illustrated on page 31.

Other System Components (See pages):

Receivers	132
Equipment Shelters	301-311
Pressurization Equipment	277-285

Ku-Band Antenna System Components

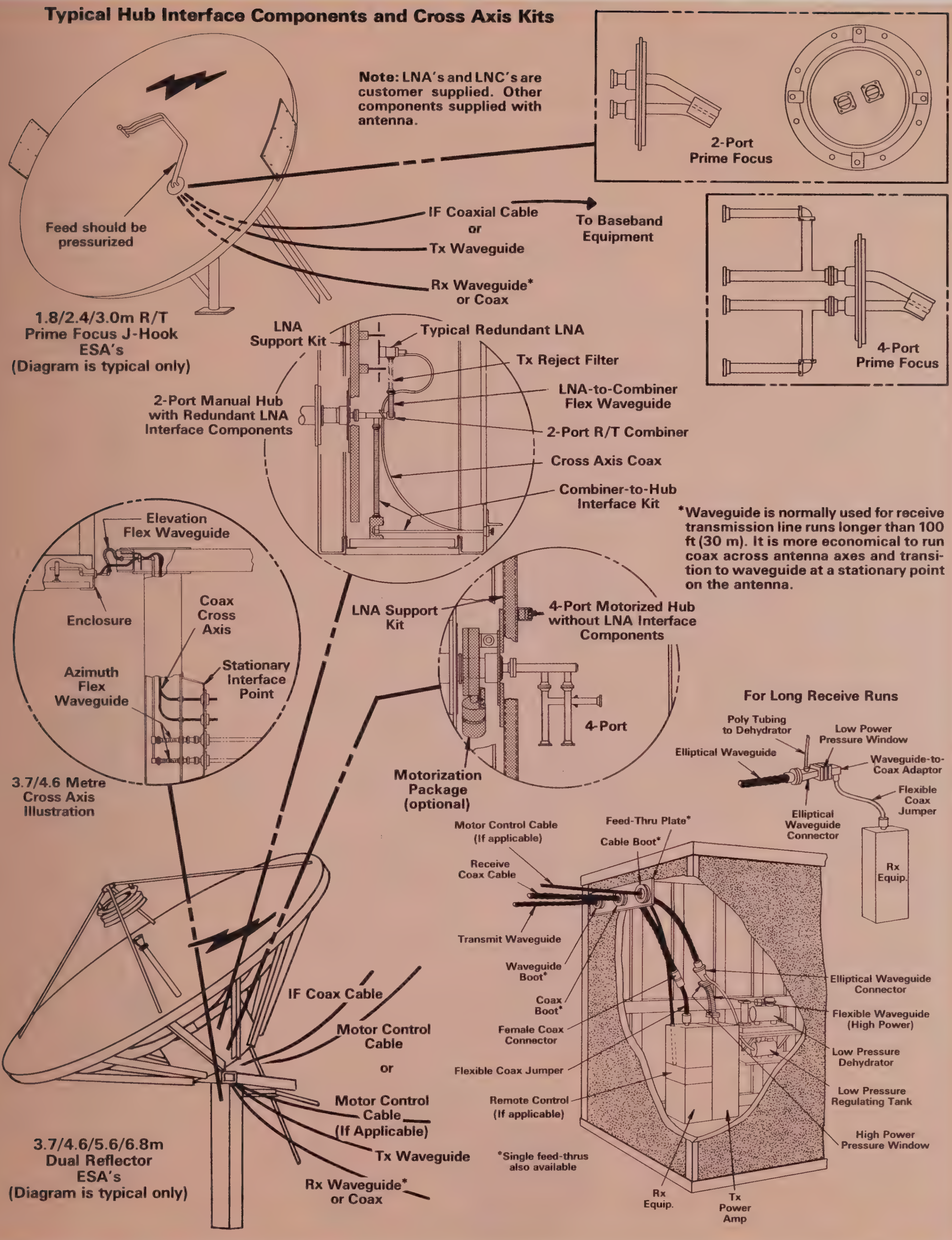
Earth Station Antennas	5.6m	4.6m	3.7m	3.0/2.4/1.8m	1.8m R/O
Hub Interface Components					
LNA/LNC Electronics Support	204675	204675	204675	—	—
Combiner-to-LNA Flexible Waveguide‡	163614-12	163614-12	163614-12	163614-12	—
Combiner-to-Enclosure Waveguide, One Run	204700A-1	204600-2	204600-2	—	—
Two Runs	204700A-2	204600-1	204600-1	—	—
Transmit Reject Filter, 50 dB, 11.7-12.2 GHz	205746	205746	205746	205746	—
70 dB, 10.95-12.2 GHz	205746-2	205746-2	205746-2	205746-2	—
Receive or Transmit Waveguide Cross Axis Kit					
Azimuth and Elevation, One Run	204675-1	204592-3	204592-3	—	—
Two Runs	204675-2	204592-1	204592-1	—	—
Four Runs	204675-4	204592-2	204592-2	—	—
Cross Axis Coaxial Jumper, 10.95-12.75 GHz, 16 feet (4.87 m)					
SMA Plug/SMA Plug	39808-36	39808-36	39808-36	39808-36	39808-36
SMA Plug/Type N Plug	39809-17	39809-17	39809-17	39809-17	39809-17
Type N Plug/Type N Plug	39806-48	39806-48	39806-48	39806-48	39806-48
Remote Motor Control Cable					
Cable Type Number	200775	200775	200775	—	—
Maximum Length, ft (m)	1000 (305)	1000 (305)	1000 (305)	—	—
Earth Station Antenna Controller – Rack Mount – See Page 127					
220/120V, 50/60 Hz	AAC100	AAC100	AAC100	—	—

Transmission Line System Components

	52-88 or 100-150 MHz	940 to 1450 MHz	3.7 to 4.2 GHz	10.95 to 11.7 GHz	11.7 to 12.2 GHz	12.25 to 12.75 GHz	14.0 to 14.5 GHz	See Pages
HELIAX® Elliptical Waveguide – See Pages 190-194 for Accessories								
Waveguide Flanges mate with	—	—	—	PBR120	PBR120	PBR120	PBR120	208
Elliptical Waveguide	—	—	—	EW90††	EW127A	EW127A	EW132	180-194
Connector	—	—	—	290SC	1127DC	1127DC	2132DC	186-189
Rigid Rectangular Waveguide Components – See Pages 202-209 for Additional Components								
Waveguide Flanges mate with	—	—	—	WR75 Choke/Cover	WR75 Choke/Cover	WR75 Choke/Cover	WR75 Choke/Cover	208
Flex-Twist, High Power, 1300 W	—	—	—	—	—	—	163228-(†)	203
Flex-Twist, Low Power, 600 W	—	—	—	163614-(†)	163614-(†)	163614-(†)	163614-(†)	
Flex (No Twist), High Power, 1300 W	—	—	—	—	—	—	162615-(†)	203
Pressure Window, High Power, 2000 W	—	—	—	—	—	—	202378-3	203
Pressure Window, Low Power, 10 W	—	—	—	55000-75	55000-75	55000-75	55000-75	
Termination Load	—	—	—	39098-75	39098-75	39098-75	39098-75	
Transition WR75 Choke/Cover to Type N Female	—	—	—	59210-75	59210-75	59210-75	59210-75	
HELIAX Coaxial Cable – See Pages 252-256 for Accessories								
1/2" Air Dielectric, 50 ohm	—	207032-1	207032-2	—	—	—	—	244
Connector, 1/2" Air, N Plug	—	74AN	74AN	—	—	—	—	
Foam Dielectric, 50 ohm (Size)	—	43818-42 (1/2")	43818-5 (1/2")	49774-3 (3/8")	49774-3 (3/8")	49774-3 (3/8")	42130-12 (1/4")	244
Connector, N Jack	—	L44N	L44N	L42EN	L42EN	L42EN	41EN	
Connector, N Plug	—	L44W	L44W	L42EW	L42EW	L42EW	41EW	
Foam Dielectric, 75 ohm (Size)	LDF4-75A (1/2")	—	—	—	—	—	—	
Connector, N Jack	L44N-70	—	—	—	—	—	—	
Connector, N Plug (70 ohm Mating Pin)	L44W-70	—	—	—	—	—	—	
Superflexible, 50 ohm (Size)	—	47869A-1 (1/2")	47869A-11 (1/2")	48659-10 (1/4")	48659-10 (1/4")	48659-11 (1/4")	48659-11 (1/4")	244
Connector, N Jack	—	44ASN	44ASN	—	—	—	—	
Connector, N Plug	—	44ASW	44ASW	41SEW	41SEW	41SEW	41SEW	
Superflexible, 75 ohm (Size)	FSJ1-75 (1/4")	—	—	—	—	—	—	222
Connector, N Jack	41SN-70	—	—	—	—	—	—	223
Connector, N Plug	41SW-70	—	—	—	—	—	—	223
Jumper Cable Assembly, N Plug/N Plug	39818A-203	48363A	48367A	201084A	201084A	201085	201085	244

† Specify length in inches, -12 (1 ft), -24 (2 ft) or -36 (ft).
‡ Order one for one receive run or two for two receive runs.
†† EW90 recommended for lowest attenuation. EW127A also suitable.

Typical Hub Interface Components and Cross Axis Kits



Introduction

For nearly 50 years, Andrew has offered a comprehensive line of broadcast products. Our current product line includes TRASAR® television broadcast antennas, HELIAX® coaxial cables, rigid coaxial transmission lines, UHF-TV circular waveguide and pressurization equipment.

TRASAR Antennas

TRASAR television broadcast transmitting antennas combine a traveling wave, slotted radiator with a cylindrical radome to yield the highest levels of performance and reliability in the industry. All TRASAR antennas provide excellent near-in coverage, while maintaining desired gain. The Andrew design simultaneously optimizes gain, half-power beamwidth and null fill to provide unequalled aperture efficiency.

TRASAR antennas are described in detail on pages 133-141.

Transmission Line Selection

Considerations in selecting a transmission line for use in broadcast systems are power-handling capability, attenuation, transmission line system cost and VSWR performance.

HELIAX Coaxial Cables are supplied in long, continuous, flexible lengths, permitting one-piece installations. These cables range in size from 1/2" to 5" diameter for air-dielectric versions and 1/4" to 1-5/8" for foam-dielectric versions. HELIAX cables are ideal for low to medium power applications.

Rigid Coaxial Transmission Lines are offered in sizes up to 6-1/8" and offer high power-handling capability and low attenuation. Premium versions (ACX Series) feature heavy-duty TEFLON® disk insulators and heavy-duty welded flanges. A patented bellows inner conductor design compensates for differential expansion between the inner and outer conductors.

Circular Waveguide offers lowest attentuation, highest power-handling capability and extremely low signal distortion for UHF-TV transmitting antenna systems. Andrew offers four sizes of circular waveguide, each optimized for a specific range of UHF-TV channels.

AM Radio Systems

HELIAX coaxial cable is the ideal choice for AM radio applications because of its cost and performance advantages.

FM Radio and VHF-TV Systems

Premium rigid coaxial lines are recommended for systems requiring highest power handling capability and lowest attenuation. Sizes up to 6-1/8" in diameter will satisfy the requirements of most FM radio and VHF-TV systems. HELIAX coaxial cables are recommended for most low to medium power applications.

UHF-TV Systems

UHF-TV broadcasters usually have power-handling and attenuation requirements that can only be satisfied with 6-1/8" rigid coaxial line or ACX Series circular waveguide. Circular waveguide has higher power-handling capability and lower attenuation than coaxial line and is especially recommended for the higher UHF-TV channels. Compared with rectangular waveguides, circular waveguide provides lower attenuation and lower tower loading.

Low Power Television (LPTV) Systems

HELIAX coaxial cables are most economical for typical LPTV stations.

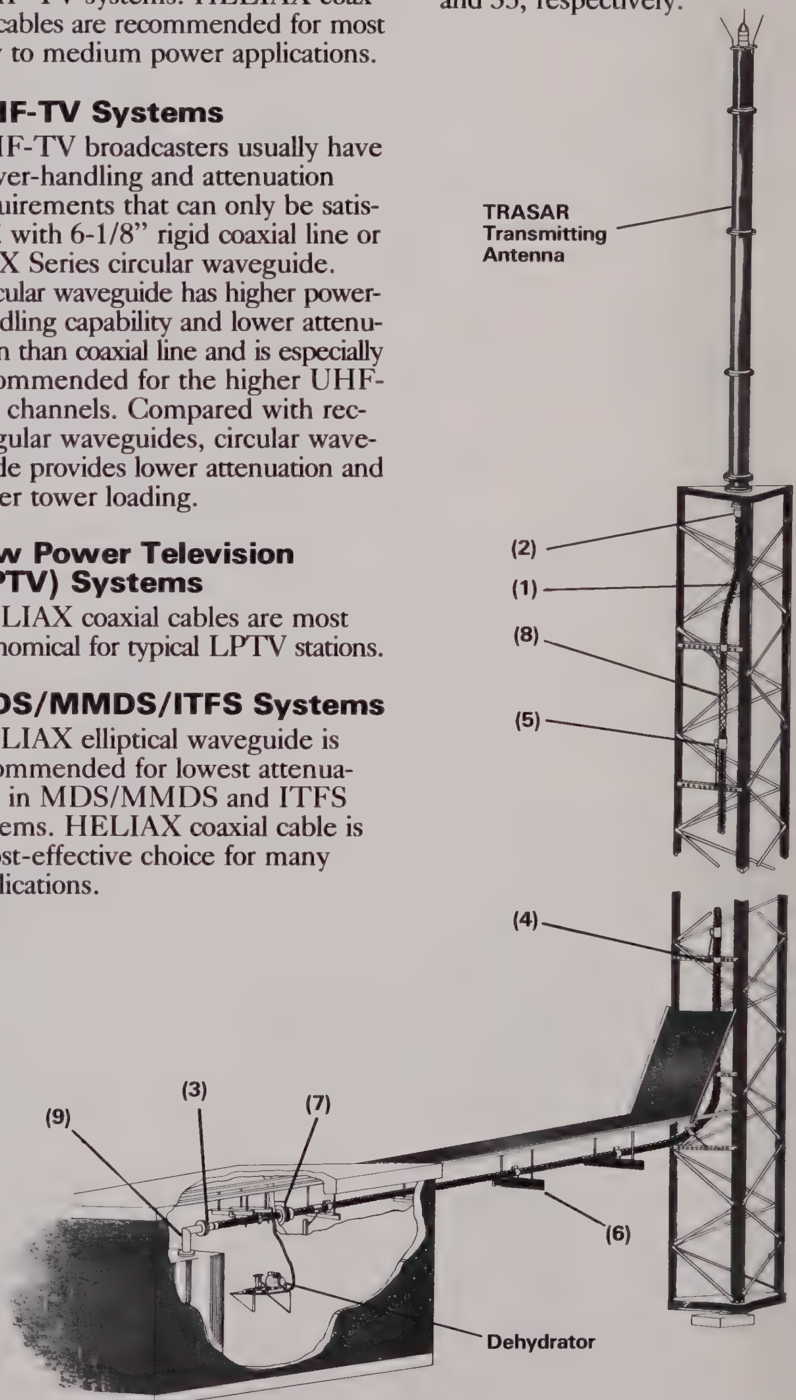
MDS/MMDS/ITFS Systems

HELIAX elliptical waveguide is recommended for lowest attenuation in MDS/MMDS and ITFS systems. HELIAX coaxial cable is a cost-effective choice for many applications.

Typical Systems Using HELIAX Coaxial Cables

A typical TRASAR antenna system fed with HELIAX coaxial cable is illustrated below. Item numbers in the illustration are referenced in the table on page 33. The components listed are examples, not complete product listings. See the referenced pages for descriptions, specifications, ordering information and alternate components.

Rigid line and circular waveguide systems are illustrated on pages 34 and 35, respectively.



HELIAX® Coaxial Cable System Components

Item No.	Description	Foam-Dielectric Cables 7/8"	1-1/4"	1-5/8"	Air-Dielectric Cables 7/8"	1-5/8"	3"	4"	5"	See Pages
HELIAX Coaxial Cable										
1	Standard Type Number	LDF5-50A	LDF6-50A	LDF7-50A	HJ5-50*	HJ7-50A*	HJ8-50B*	HJ11-50*	HJ9-50*	228-239
1	Low VSWR Type Number	—	—	—	—	42140*	42141*	42144*	42142*	245
HELIAX Connectors										
2	7/8" EIA	L45R	L46S	L47S	75AR	87S	—	—	—	
3	7/8" EIA with Gas Barrier	—	—	—	75AG	87SG	—	—	—	
2	1-5/8" EIA	—	L46R	L47R	—	87R	—	—	—	
3	1-5/8" EIA with Gas Barrier	—	—	—	—	87G	—	—	—	
2	3-1/8" EIA	—	—	—	—	—	78ARF†	81RF†	—	
3	3-1/8" EIA with Gas Barrier	—	—	—	—	—	78AGF†	81GF†	—	
2	6-1/8" EIA	—	—	—	—	—	—	42896††	79R	
3	6-1/8" EIA with Gas Barrier	—	—	—	—	—	—	42986††	79G	
Accessories										
4	Hanger Kit of 10	42396A-5	42396A-1	42396A-2	42396A-5	42396A-2	31766-11	31766-10	33598-5	252, 253
	Hardware Kit, 3/4" long	31769-5	31769-5	31769-5	31769-5	31769-5	31769-5	31769-5	—	252, 253
	1" long	31769-1	31769-1	31769-1	31769-1	31769-1	31769-1	31769-1	—	252, 253
	1-1/4" long	—	—	—	—	—	—	—	31769-4	252, 253
	Angle Adaptor Kit	31768A	31768A	31768A	31768A	31768A	31768A	31768A	33981A-1	252, 253
	Round Member Adaptor	31670-(**)	31670-(**)	31670-(**)	31670-(**)	31670-(**)	31670-(**)	31670-(**)	43130-(**)	252, 253
	Tower Standoff Kit of 10									
	1 in Standoff	30848-(**)	30848-(**)	30848-(**)	30848-(**)	30848-(**)	30848-(**)	30848-(**)	—	252, 253
	2.5 in Standoff	41108A-(**)	41108A-(**)	41108A-(**)	41108A-(**)	41108A-(**)	41108A-(**)	41108A-(**)	—	252, 253
	Threaded Rod Support Kit									
	12 in (305 mm)	31771	31771	31771	31771	31771	31771	31771	—	252, 253
	24 in (610 mm)	31771-9	31771-9	31771-9	31771-9	31771-9	31771-9	31771-9	—	252, 253
	Insulated Hanger	11662-2	—	33948-3	11662-2	33948-3	33948-2	33948-4	33948-1	254, 255
	Angle Adaptor for Insulated Hanger	40430-1	—	13555A	40430-1	13555A	13555A	13555A	13555A	254, 255
	Round Member Adaptor for Insulated Hanger	12395-1	—	13550	12395-1	13550	13550	13550	13550	254, 255
5	Grounding Kit	204989-2	204989-3	204989-4	204989-2	204989-4	204989-5	204989-6	204989-7	254, 255
6	Transmission Line Support	Support angle and threaded rod kit								297
7	Wall/Roof Feed Thru	40656-1	40656-5	40656-2	40656-1	40656-2	40394-2	40394-1	33938-5	252, 256
8	Hoisting Grip	19256B	24312A	24312A	19256B	24312A	26985A	34759	31031-1	254, 255
9	90° Miter Elbow									
	7/8" EIA, 50 ohm	1060A	1060A	—	1060A	1060A	—	—	—	265
	1-5/8" EIA, 50 ohm	—	1061A	1061A	—	1061A	—	—	—	265
	3-1/8" EIA, 50 ohm	—	—	—	—	—	1062A	1062A	—	265
	6-1/8" EIA, 50 ohm	—	—	—	—	—	—	ACX650-10	ACX650-10	265
	Other Rigid Line Components									262-271

*Specify 6 MHz band.
**See table on page 253.
† Inner connector not included. Order Type 15093A, if required.
†† Inner connector not included. Order Type 18902, if required.

TRASAR® Transmitting Antennas

Description	Series	See Pages
VHF-TV		
High Power, Circular Pol.	V	134, 135
High Power, Horizontal Pol.	V	134, 135
UHF-TV		
High Power, Circular Pol.	H	136, 137
High Power, Horizontal Pol.	H	136, 137
Medium Power, Top Mount	S	138
Medium Power, Side Mount	G	139
Low and Intermediate Power	L	140, 141

Pressurization Equipment

Description	Type No.	See Pages
Dehydrator, Automatic	1920E Series	277-279
Dehydrator, Automatic	1930C Series	277-279
Dehydrator, Manual	40525A Series	277-279
Monitor	40004 Series	283
Equipment and Accessories		277-285

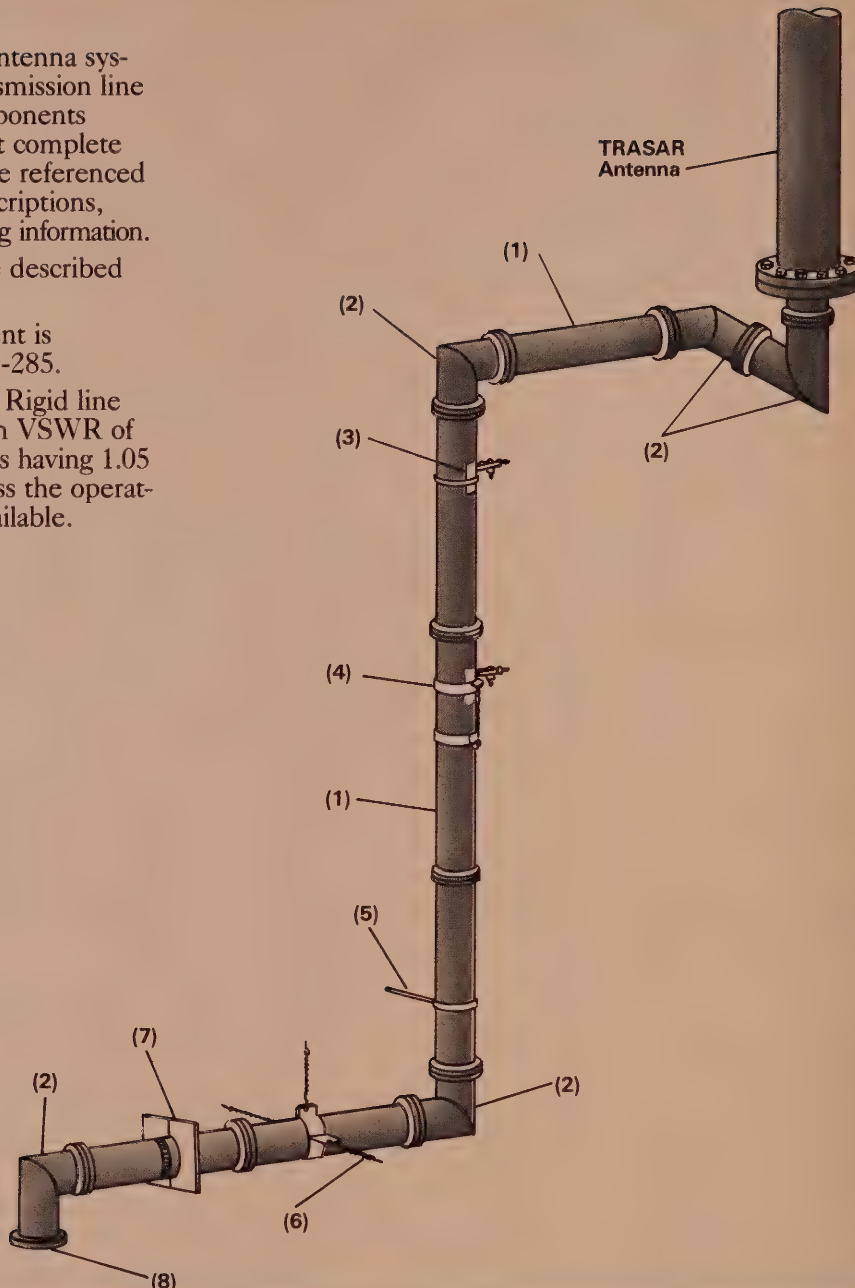
Broadcast Antenna System Using Rigid Line

A typical TRASAR® antenna system fed with rigid transmission line is illustrated. The components listed are examples, not complete product listings. See the referenced pages for complete descriptions, specifications and ordering information.

TRASAR antennas are described on pages 133-141.

Pressurization equipment is described on pages 277-285.

System Performance. Rigid line systems have maximum VSWR of 1.07. Optimized systems having 1.05 maximum VSWR across the operating channel are also available.



Rigid Transmission Line System Components

Item No.	Description	3-1/8" 50 ohm	4-1/16" 50 ohm	6-1/8" 50 ohm	6-1/8" 75 ohm	See Pages
1	Straight Section	ACX350 Series	ACX450 Series	ACX650 Series	ACX675 Series	263
2	90° Miter Elbow	1062A	ACX450-10-(*)	ACX650-10-(*)	ACX675-10-(*)	265
3	Rigid Hanger**	13927	ACX450-13	ACX675-13	ACX675-13	269, 271
4	Vertical Spring Hanger†	ACX350-11	ACX450-11	ACX675-11	ACX675-11	271
5	Lateral Brace	ACX350-14	ACX450-14	ACX675-14	ACX675-14	271
6	3-Point Suspension Hanger†	ACX350-12	ACX450-12	ACX675-12	ACX675-12	270
7	Wall Feed Thru	ACX350-15	ACX450-15	ACX675-15	ACX675-15	271
8	Gas Barrier	1262B	ACX450-16	ACX650-16	ACX675-16	266

*Specify television channel or frequency.

†Use at 10 ft (3 m) intervals

**

Line Size	Quantity Required
3-1/8"	One for every 300 ft (90 m)
4-1/16"	One for every 500 ft (150 m)
6-1/8"	One for every 1000 ft (300 m)

Broadcast Antenna System Using Circular Waveguide

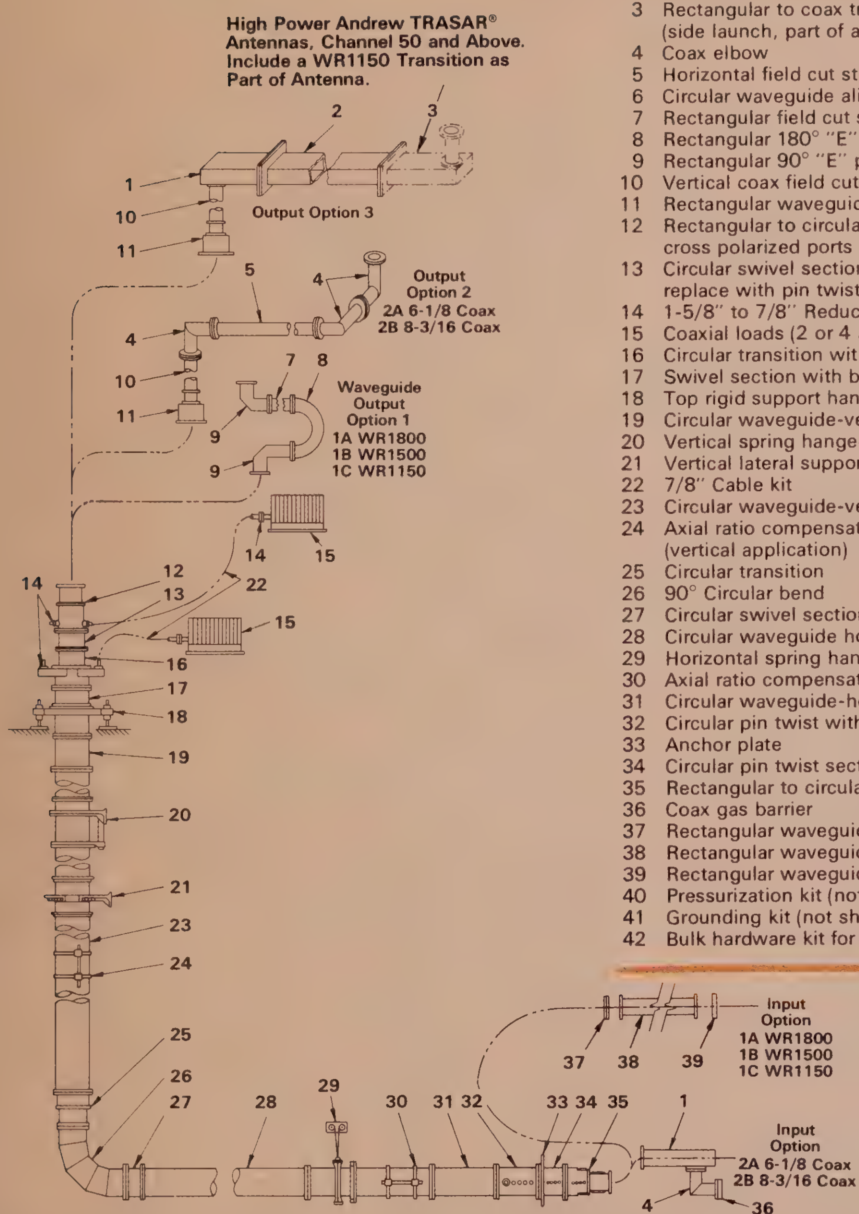
A typical TRASAR® UHF-TV antenna system fed with circular waveguide is illustrated. Andrew offers four sizes of circular waveguide, each optimized for a specific range of UHF-TV channels. Sizes are WC1750, WC1700, WC1500 and WC1350. Circular waveguide is sold by Andrew on a system basis. Refer to pages 272 and 273 for further information.

TRASAR antennas are described on pages 133-139.

Pressurization equipment is described on pages 277-285.

Circular Waveguide System Components

Item No.	Description
1	Rectangular to coax transition (side launch)
2	Rectangular field cut straight section (with tuners)
3	Rectangular to coax transition (side launch, part of antenna)
4	Coax elbow
5	Horizontal field cut straight section
6	Circular waveguide alignment pins (not shown)
7	Rectangular field cut straight section
8	Rectangular 180° "E" plane "U" bend
9	Rectangular 90° "E" plane miter
10	Vertical coax field cut straight section
11	Rectangular waveguide to coax (end launch)
12	Rectangular to circular transition with cross polarized ports and tuner
13	Circular swivel section (option 1: replace with pin twist Item 34)
14	1-5/8" to 7/8" Reducer
15	Coaxial loads (2 or 4 as required)
16	Circular transition with mode filter
17	Swivel section with bearing flange
18	Top rigid support hanger (milk-stool)
19	Circular waveguide-vertical field cut
20	Vertical spring hanger
21	Vertical lateral support
22	7/8" Cable kit
23	Circular waveguide-vertical
24	Axial ratio compensator (vertical application)
25	Circular transition
26	90° Circular bend
27	Circular swivel section
28	Circular waveguide horizontal field cut
29	Horizontal spring hanger
30	Axial ratio compensator (horizontal application)
31	Circular waveguide-horizontal
32	Circular pin twist with test ports
33	Anchor plate
34	Circular pin twist section
35	Rectangular to circular waveguide transition and tuner
36	Coax gas barrier
37	Rectangular waveguide gas barrier (hi-press)
38	Rectangular waveguide tuning section
39	Rectangular waveguide gas barrier (lo-press)
40	Pressurization kit (not shown)
41	Grounding kit (not shown)
42	Bulk hardware kit for hanger mounting (not shown)



System Performance

VSWR: 1.08 to 1 or better over channel with optimization to 1.05 or better at visual carrier.

Reconverted Mode Level: –50 dB or better for all possible trapped modes at system output.

Cross Polarization Loss: total power lost in reject loads from all sources shall not exceed 1% of transmitter power during normal operating conditions, nor exceed 2% during brief periods of extreme environmental conditions.

Flange Reflection: circular waveguide does not exhibit band reject VSWR spikes associated with coaxial and rectangular waveguide transmission lines because of the extremely small mismatch of the circular flange junction.

ITFS/MMDS/MDS Antenna Systems

Andrew offers a complete line of products and services for ITFS, MMDS and MDS systems. Typical components for systems using HELIAX® cable are illustrated on page 37 and listed in the table below. The components listed are examples and not complete product listings. See the referenced pages for complete descriptions, ordering information and alternate components.

For systems requiring lowest possible attenuation, HELIAX elliptical waveguide, Type EW20 for 2.5-2.7 GHz and Type EW17 for 2.15-2.163 GHz are recommended. See pages 180-194.

HELIAX Elliptical Waveguide System Components

Item No.	Description	2.5 to 2.7 GHz	2.15 to 2.163 GHz	See Pages
1	Elliptical Waveguide	EW20	EWP17	180-189
	Attenuation, dB/100 ft (dB/100 m)			
	2.6 GHz	0.43 (1.41)	—	
	2.16 GHz	—	0.34 (1.16)	
	Connector, 7/8" EIA			
2	no gas barrier	120R-3	117RT-3	186, 188
3	with gas barrier	120R	117RT	186, 188
4	Hanger Kit of 10	31766-10	31766-9	190
5	Grounding Kit	204989-6	204989-6	192
6	Wall/Roof Feed Thru	35849-9	35849-10	193

Other Accessories

Item No.	Description	2.5 to 2.7 GHz	2.15 to 2.163 GHz	See Pages
Jumper Cables				
7	N Plug/N Plug, 3 ft (0.9 m)	48695-3	41656B-3	240
7	N Plug/N Plug, 6 ft (1.8 m)	48695-6	41656B-6	240
7	7/8" EIA/N Plug, 3 ft (0.9 m)	202638-3	200834-3	240
7	7/8" EIA/N Plug, 6 ft (1.8 m)	202638-6	200834-6	240
Power Dividers				
8	N Jack, Solid Dielectric	—	62795	142
8	7/8" EIA, Air Dielectric	58249	64104	142

HELIAX Coaxial Cable System Components

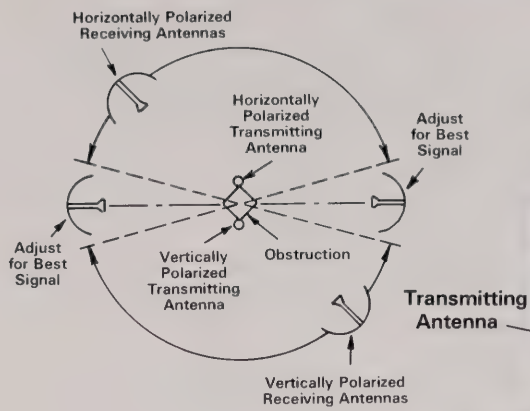
Item No.	Description	Foam Dielectric 1/2"	Foam Dielectric 7/8"	Foam Dielectric 1-1/4"	Foam Dielectric 1-5/8"	Air Dielectric 7/8"	Air Dielectric 1-5/8"	See Pages
HELIAX Coaxial Cables								
1	Coaxial Cable	LDF4P-50A*	LDF5P-50A*	LDF6P-50*	LDF7P-50A*‡	HJ5P-50*	HJ7P-50*	240-243
	VSWR, Max. 2.5-2.7 GHz	1.15	1.20	1.20	—	1.08	1.15	
	VSWR, Max. 2.15-2.163 GHz	1.15	1.12	1.15	1.15	1.08	1.15	
	Attenuation, dB/100 ft (100 m)							
	at 2.6 GHz	4.02 (13.2)	2.31 (7.6)	1.70 (5.6)	—	2.17 (7.1)	1.24 (4.1)	
	at 2.16 GHz	3.61 (11.8)	2.07 (6.8)	1.52 (5.0)	1.31 (4.3)	1.95 (6.1)	1.10 (3.6)	
Connectors								
2, 3	N Plug (male)	L44W	L45W	L46W†	—	75WT	87WT	241, 243
2, 3	N Jack (female)	L44N	L45N	L46N†	L47N	75NT	87NT	241, 243
2, 3	7/8" EIA Flange, no gas barrier	L44R	L45R	L46S**	—	75AR	87S	241, 243
3	7/8" EIA Flange, gas barrier	—	—	—	—	75AG	87SG	241, 243
Accessories								
4	Hanger Kit of 10	43211	42396A-5	42396A-1	42396A-2	42396A-5	42396A-2	252, 253
	Hardware Kit of 10, 3/4" long	31769-5	31769-5	31769-5	31769-5	31769-5	31769-5	252, 253
	Hardware Kit of 10, 1" long	31769-1	31769-1	31769-1	31769-1	31769-1	31769-1	252, 253
	Round Member Adaptor, member diameter in (mm)							252, 253
	1-2 (25-50)	31670-1	31670-1	31670-1	31670-1	31670-1	31670-1	
	2-3 (50-75)	31670-2	31670-2	31670-2	31670-2	31670-2	31670-2	
	3-4 (75-100)	31670-3	31670-3	31670-3	31670-3	31670-3	31670-3	
	4-5 (100-125)	31670-4	31670-4	31670-4	31670-4	31670-4	31670-4	
	5-6 (125-150)	31670-5	31670-5	31670-5	31670-5	31670-5	31670-5	
	Angle Adaptor Kit of 10	31768A	31768A	31768A	31768A	31768A	31768A	252, 253
	12 in Threaded Rod Support Kit of 5	31771-4	31771-4	31771-4	31771-4	31771-4	31771-4	252, 253
	Nylon Cable Tie Kit of 50	40417	40417	—	—	40417	—	254, 255
	Hoisting Grip	43094	19256B	24312A	24312A	19256B	24312A	254, 255
5	Grounding Kit	204989-1	204989-2	204989-3	204989-4	204989-2	204989-4	254, 255
6	Wall/Roof Feed Thru	40656-3	40656-1	40656-5	40656-2	40656-1	40656-2	256
	Connector Burial Kit	34283	34283	34283	34283	34283	34283	255
	Splice	L44Z	L45Z	L46Z	L47Z	75AZ	87Z	

*Specify frequency band.
**Includes pressure path and pressure port for use in pressurized systems.
†Includes gas barrier and pressure port for use in pressurized systems.
‡Not applicable for 2.5-2.7 GHz.

Dual Antenna Systems

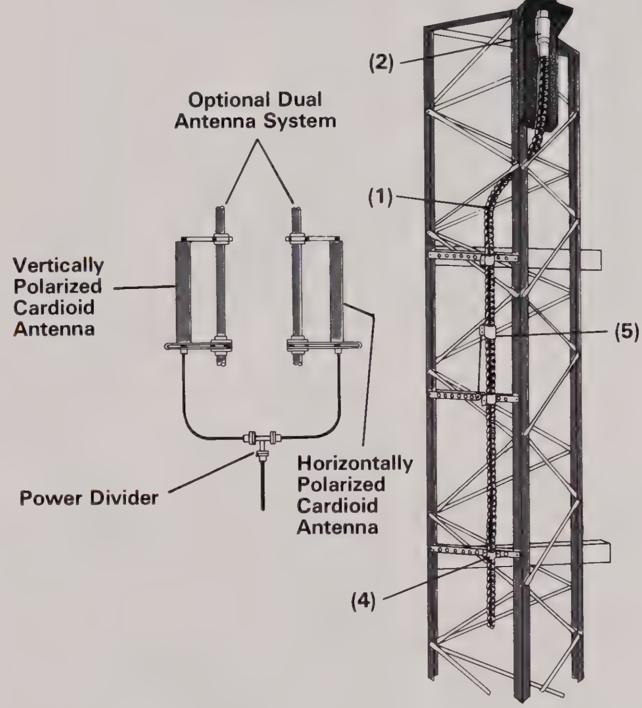
When an omnidirectional antenna cannot be used because of building or tower obstructions, two directional antennas can be used as shown.

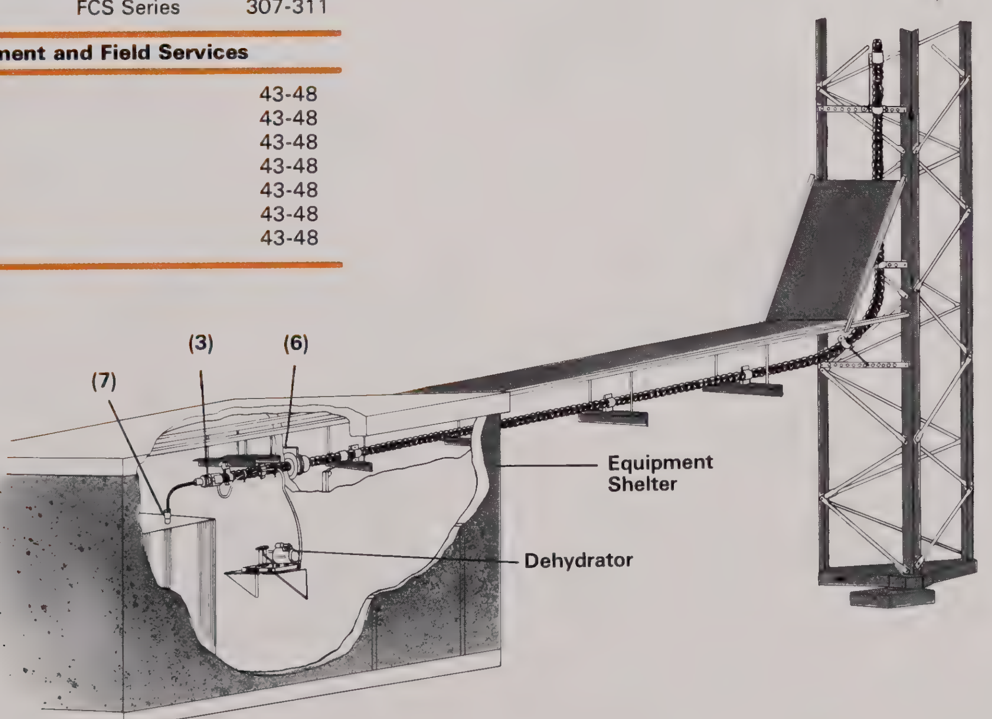
Andrew pioneered this concept using antennas with opposite polarizations to minimize deep nulls and interference at the pattern crossover points. The phase relation between transmitting antennas is not important when opposite polarizations are used. Receive antennas positioned in the crossover areas can be adjusted on-site for maximum receive signal. Power dividers are used to feed both transmitting antennas.



System Equipment

Description	Type Number	See Pages
Transmission Antennas		
Andrew offers a wide variety of transmitting antennas for ITFS, MMDS and MDS applications. Variations include omnidirectional/cardioid, horizontal/vertical polarization, top/side mount		142, 143
Transmission Lines		
See HELIAX® Coaxial Cable System Table		36
Pressurization Equipment		
Dehydrator, Automatic	1930C Series	277-279
Dehydrator, Manual	40525A Series	277-279
Equipment and Accessories		277-285
Towers		
Self-Supporting, light duty	LST	294-295
Guyed, light duty	R24	288, 289
Medium and heavy-duty towers, and a full range of accessories are also available		286-300
Equipment Shelters		
PLASTIDOME®	GES Series	301-306
Concrete	FCS Series	307-311
Engineering, Program Management and Field Services		
System Design Assistance		43-48
Program Management		43-48
Foundations/Civil		43-48
Freight		43-48
Delivery and Assembly		43-48
Installation		43-48
System Testing		43-48





Andrew offers a complete line of premium quality communications equipment for cellular radio systems. Like all Andrew products, the cellular systems provide the highest quality, performance and reliability available in the industry. Andrew's HELIAX® coaxial cable, for example, is the specified cable for use in major cellular radio systems, and helped put the first cellular systems in the United States on-the-air.

In addition to coaxial cables, Andrew supplies the required shelters, towers, antennas, pressurization equipment and complete systems integration.

Program Management and Field Services

Andrew provides program management and complete field services for all aspects of cellular site construction and systems integration including:

- Subsystem engineering, installation preplanning and scheduling
- Site civil work such as site clearing and grading, access road construction, fencing and grounding
- Delivery to site of all system equipment
- Tower and building foundation construction
- Tower erection
- Cellular and microwave antenna and transmission line installation and testing
- Factory installation of radio racks, wiring, power source equipment and other equipment in concrete or PLASTIDOME® shelters
- Installation of PLASTIDOME or concrete shelters and on-site power connection

Emergency Restoration Service

Andrew can provide emergency equipment and repair service for cellular radio systems. Certain types of commonly used directional and omnidirectional antennas are maintained in inventory for use in emergencies or as part of new systems being installed by Andrew. For further information, contact your local Andrew Sales Office listed inside the back cover.

Maintenance Program

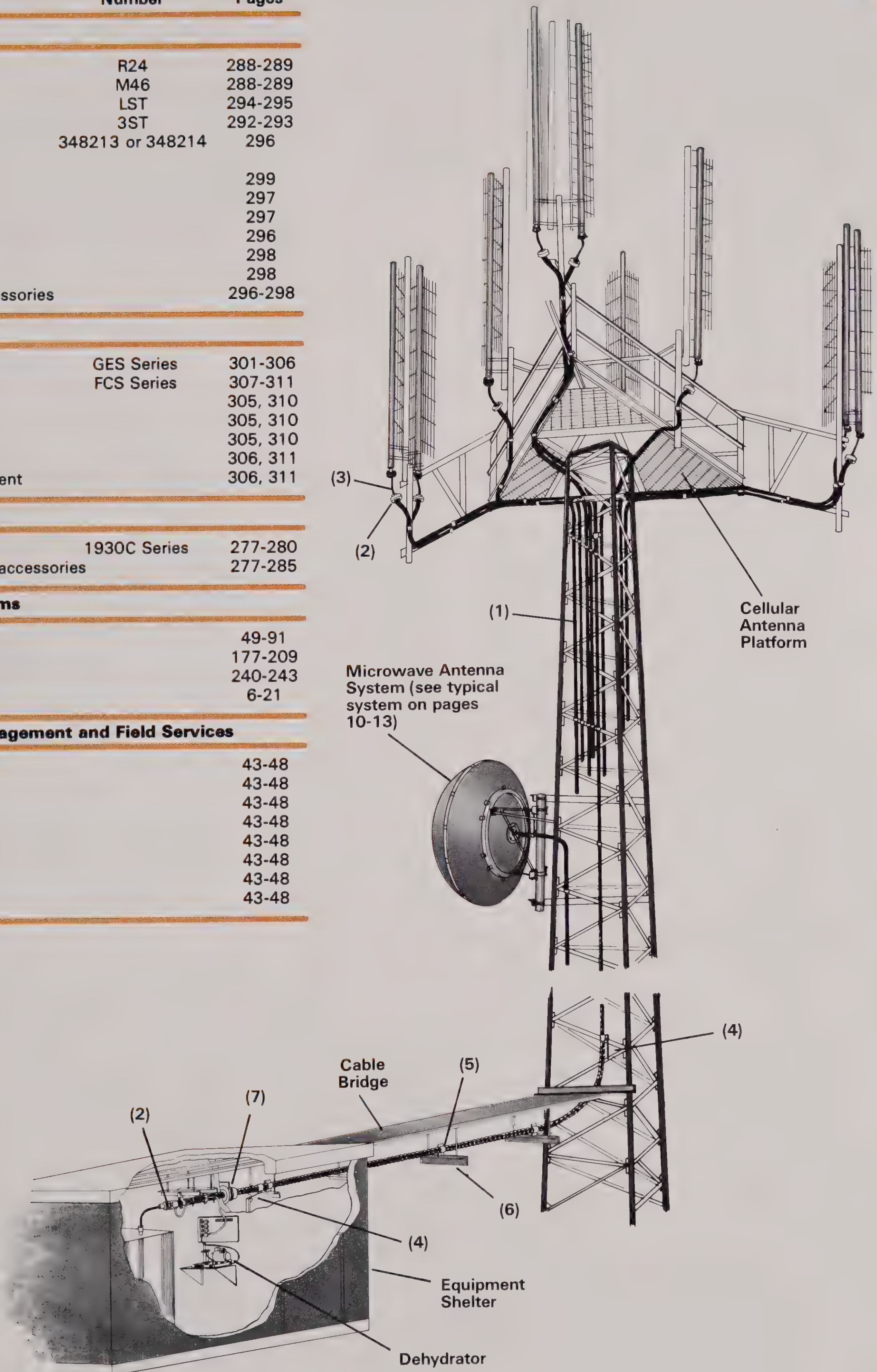
Andrew offers a complete site inspection and maintenance program for cellular systems throughout the United States. An engineering evaluation team will inspect and report on the condition of your towers, antennas and transmission lines, semiannually, to ensure that the equipment meets your exacting standards.

Transmission Line System Components

Item No.	Description	1/2"	7/8"	1-1/4"	1-5/8"	See Pages
Unpressurized Feeder System						
1	HELIAX Foam Dielectric Cable	43818-41	42150B-48	205360	42151A-18	247
	(Similar to)	(LDF4-50A)	(LDF5-50A)	(LDF6-50)	(LDF7-50A)	
	Attenuation at 890 MHz, dB/100 ft (dB/100 m)	2.19 (7.19)	1.22 (4.02)	0.91 (2.97)	0.76 (2.51)	
2	Connectors, N Plug	L44W	L45W	L46W	L47N	225-231
	N Jack	L44N	L45N	L46N	—	225-231
3	Optional Jumper Cables	Selected 1/2" LDF foam and superflexible versions offered				247
4	Grounding Kit	204989-1	204989-2	204989-3	204989-4	254, 255
5	Hangers	43211	42396A-5	42396A-1	42396A-2	252, 253
6	Transmission Line Support	Support Angle and Threaded Rod Kit				253, 297
7	Wall/Roof Feed Thru	Single and Multiple Entrance (boots/plates) versions offered				256
	Hoisting Grip	43094	19256B	24312A	24312A	254, 255
Pressurized Feeder System						
1	HELIAX Air Dielectric Cable	—	25831-3	205360	25816A-31	247
	(Similar to)	—	(HJ5-50)	(LDF6-50)	(HJ7-50A)	
	Attenuation at 890 MHz, dB/100 ft (dB/100 m)	—	1.19 (3.91)	0.91 (2.97)	0.65 (2.14)	
2	Connectors, N Plug	—	75AN	L46N	87N	231, 235, 237
	7/8" EIA	—	75AR	L46S	87S	231, 235, 237
3	Jumper Cables					
	For Equipment Room	Selected 1/2" foam and superflexible versions offered				247
	For Antenna Connection	—	48148	48148	48148	247
4	Grounding Kit	—	204989-2	204989-3	204989-4	254, 255
5	Hangers	—	42396A-5	42396A-1	42396A-2	252, 253
6	Transmission Line Support	Support Angle and Threaded Rod Kit				253, 297
7	Wall/Roof Feed Thru	Single or Multiple Entrance (boots/plates) versions offered				256
	Hoisting Grip	—	19256B	24312A	24312A	254, 255

System Equipment

Description	Type Number	See Pages
Tower		
Guyed	R24	288-289
	M46	288-289
Self-Supporting	LST	294-295
	3ST	292-293
Cellular Antenna Platform	348213 or 348214	296
Tower Accessories		
Light Kit		299
Cable Support		297
Cable Bridge		297
Climbing Devices		296
Epoxy Paint		298
Grounding Systems		298
Other tower options and accessories		296-298
Equipment Shelters		
PLASTIDOME®	GES Series	301-306
Concrete	FCS Series	307-311
Structural Options		305, 310
Door Options		305, 310
Basic Electrical System		305, 310
Optional Electrical Equipment		306, 311
Environmental Control Equipment		306, 311
Pressurization Equipment		
Dehydrator, automatic	1930C Series	277-280
Pressurization equipment and accessories		277-285
Microwave Antenna Systems		
Antennas		49-91
Waveguides		177-209
Coaxial Cables		240-243
System Planning		6-21
Engineering, Program Management and Field Services		
System Design Assistance		43-48
Program Management		43-48
Foundations/Civil		43-48
Freight		43-48
Delivery and Assembly		43-48
Installation		43-48
Path Alignment		43-48
System Testing		43-48



Foam-dielectric HELIAX® cables have long been the industry standard choice for land mobile radio base station and other low-power applications. A broad range of sizes provides for optimum cable selection. Cables are rugged, yet flexible for ease of installation, with solid copper jacketed outer conductors for years of maintenance-free performance.

Choice of the proper coaxial cable for a base station application is primarily based on attenuation; foam-dielectric HELIAX coaxial cables are generally used. They do not require pressurization, and their attenuation is sufficiently low for most applications.

Superflexible versions of HELIAX foam-dielectric cables are available for applications where flexibility is of primary importance. Small size and high flexibility make superflexible HELIAX the proper choice for vehicular installations and for densely arranged equipment rooms of the type found in major buildings.

In selecting a cable, the type of construction is important. Braided outer conductor cables are susceptible to moisture which can significantly increase attenuation. The braid also permits RF leakage. The solid copper outer conductor construction utilized in all HELIAX coaxial cables eliminates both of these problems.

The HELIAX cables typically used for land mobile radio base station applications are listed in the tables.

Transmission Line System Components

	3/8"	1/2"	7/8"	1-1/4"	1-5/8"	1/4" Superflexible	1/2" Superflexible
HELIAX Coaxial Cable							
Cable Type Number	**LDF2-50**	**LDF4-50A**	**LDF5-50A**	**LDF6-50**	**LDF7-50A**	**FSJ1-50**	**FSJ4-50B**
Attenuation dB/100 ft (dB/100 m)							
50 MHz	0.750 (2.46)	0.479 (1.58)	0.257 (0.843)	0.191 (0.627)	0.156 (0.512)	1.29 (4.24)	0.732 (2.40)
88 MHz	0.987 (3.24)	0.641 (2.11)	0.345 (1.14)	0.257 (0.843)	0.210 (0.689)	1.73 (5.68)	0.982 (3.22)
174 MHz	1.40 (4.60)	0.914 (3.00)	0.496 (1.63)	0.368 (1.27)	0.304 (0.998)	2.47 (8.11)	1.394 (4.58)
400 MHz	2.16 (7.09)	1.42 (4.66)	0.781 (2.57)	0.578 (1.90)	0.482 (1.58)	3.85 (12.7)	2.18 (7.15)
512 MHz	2.47 (8.10)	1.62 (5.32)	0.896 (2.94)	0.663 (2.18)	0.556 (1.83)	4.43 (14.6)	2.49 (8.17)
960 MHz	3.43 (11.3)	2.29 (7.52)	1.28 (4.20)	0.945 (3.10)	0.80 (2.63)	6.35 (20.9)	3.50 (11.5)
Average Power Rating, kW							
50 MHz	1.60	2.69	7.74	13.4	19.3	1.02	2.91
88 MHz	1.18	2.00	5.75	9.94	14.33	0.75	2.17
174 MHz	0.84	1.40	4.00	6.97	9.95	0.53	1.53
400 MHz	0.54	0.91	2.55	4.41	6.27	0.33	0.98
512 MHz	0.47	0.79	2.22	3.84	5.44	0.29	0.86
960 MHz	0.34	0.56	1.55	2.70	3.77	0.20	0.60
See Page	224	224	228	230	230	222	226
Suggested Cable Length*, ft (m)							
25-50 MHz	200 (61)	310 (94)	580 (177)	785 (239)	960 (293)	115 (35)	200 (61)
66-88 MHz	150 (46)	230 (70)	430 (131)	580 (177)	710 (216)	85 (26)	150 (46)
118-174 MHz	105 (32)	160 (49)	300 (91)	405 (123)	490 (149)	60 (18)	105 (32)
216-400 MHz	65 (20)	105 (32)	190 (58)	255 (78)	310 (94)	35 (11)	65 (20)
406-512 MHz	60 (18)	90 (27)	165 (50)	225 (69)	265 (81)	30 (9)	60 (18)
806-960 MHz	40 (12)	65 (20)	115 (35)	155 (47)	185 (56)	20 (6)	40 (12)
Connectors							
Type N Plug	L42W	L44W	L45W	L46W	—	41SW	44ASW
Type N Jack	L42N	L44N	L45N	L46N	L47N	—	44ASN
UHF Plug	L42P	L44P	L45P	—	—	41SP	44ASP
UHF Jack	L42U	L44U	L45U	—	—	—	44ASU
Type N Male (Right Angle)	—	43716	—	—	—	—	49600
7/8" EIA Flange	—	L44R	L45R	L46S	L47S	—	44ASR
7/16" DIN Male	—	L44DM	L45DM	L46DM	L47DM	—	—
7/16" DIN Female	—	L44DF	L45DF	L46DF	L47DF	—	—
Accessories							
Hanger Kit of 10	—	43211	42396A-5	42396A-1	42396A-2	—	43211
Hoisting Grip	—	43094	19256B	24312A	24312A	—	43094
Grounding Kit	—	204989-1	204989-2	204989-3	204989-4	—	204989-1
Wall/Roof Feed Thru	—	40656-3	40656-1	40656-5	40656-2	—	40656-3
Cable Tie Kit of 50	40417	40417	40417	—	—	40417	40417

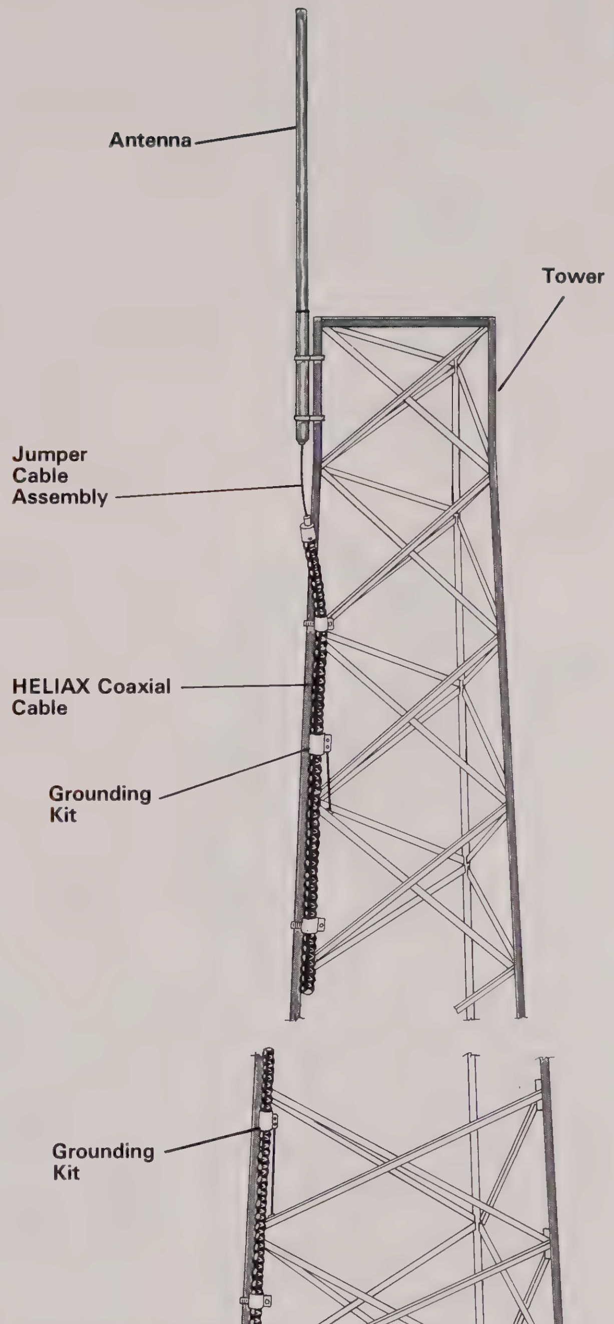
*Each entry is the maximum cable length in feet which will yield a feeder loss of 1.5 dB or less over each frequency band. A power efficiency of 70% is realized at an attenuation level of 1.5 dB. A larger cable will improve power efficiency. For example, a power efficiency of 80%, which corresponds to a feeder loss of 1 dB, will be realized by multiplying any cable length in the table by 0.67.

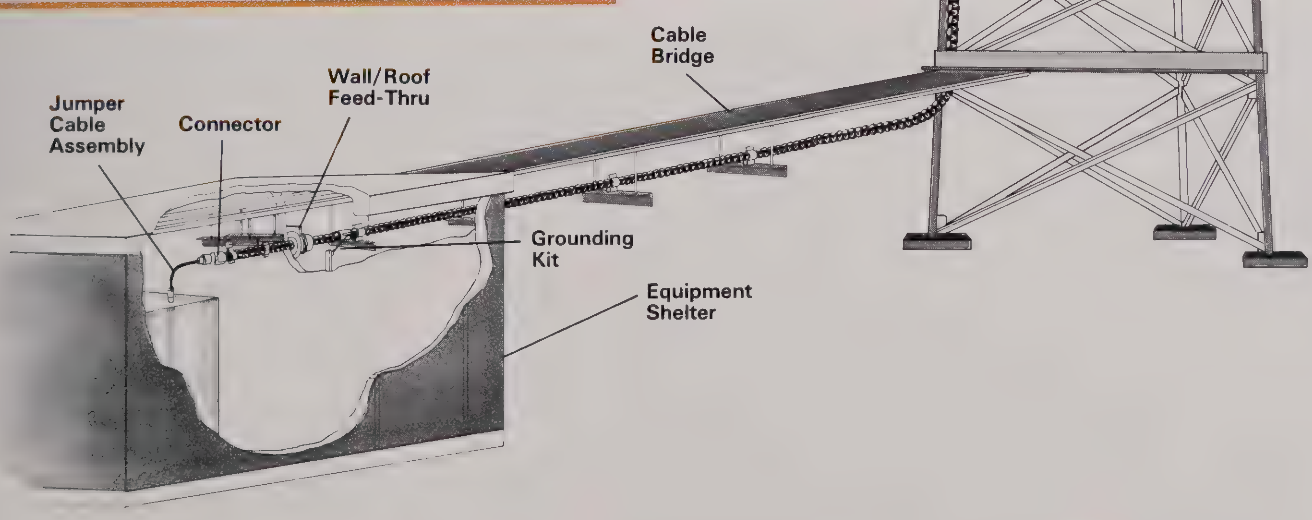
System Equipment

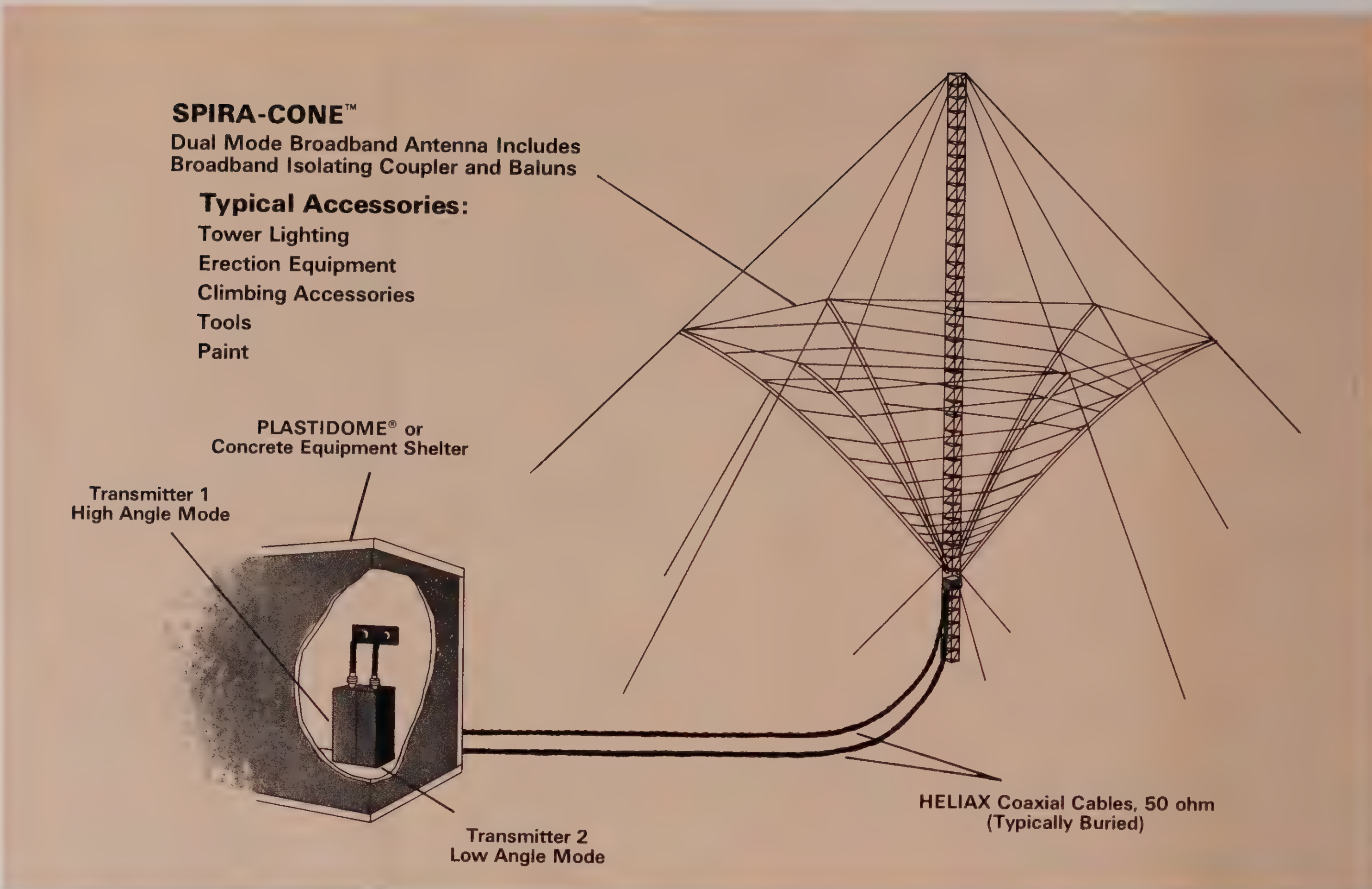
Description	Type Number	See Pages
Tower		
Guyed	R24	288-289
Self-Supporting	LST	294-295
Other tower options and accessories		296-298
Equipment Shelters		
PLASTIDOME®	GES Series	301-306
Concrete	FCS Series	307-311
Engineering, Program Management and Field Services		
System Design Assistance		43-48
Program Management		43-48
Foundations/Civil		43-48
Freight		43-48
Delivery and Assembly		43-48
Installation		43-48
Path Alignment		43-48
System Testing		43-48

HELIAX® Jumper Cable Assemblies

Connectors	Length ft (m)	Type
1/4" Superflexible Cable Assemblies		
Type N Plug/Type N Plug	8 (2.4)	48100
Type UHF Plug/Type UHF Plug	8 (2.4)	48822
Type N Plug/Type UHF Plug	8 (2.4)	204909
1/2" Superflexible Cable Assemblies		
Type N Plug/Type N Plug	8 (2.4)	49768A
Type N Plug/Type N Plug	6 (1.8)	201122
Type N Plug/Type N Plug	3 (0.9)	201124
Type N Plug/Type N Jack	8 (2.4)	49769A
Type N Plug/Type UHF Plug	8 (2.4)	49770A
1/2" LDF Foam Cable Assemblies		
Type N Plug/Type N Plug	6 (1.8)	43557-2
Type N Plug/Type N Plug	3 (0.9)	201123
Type N Plug/Type UHF Plug	6 (1.8)	43554-2
Type N Jack/Type UHF Plug	6 (1.8)	43660-2
Type UHF Plug/Type UHF Plug	6 (1.8)	43552-2
Type N Jack/Type N Plug	6 (1.8)	204908







Andrew now manufactures the complete range of GRANGER® HF Antennas, including fixed and rotatable log-periodic arrays and the patented SPIRA-CONE antenna which permits up to three transmitters to radiate without restriction on operating frequency. Antennas are available in either fixed, transportable or rooftop versions.

For over 30 years, GRANGER HF Antennas have been specified to meet a variety of HF communications needs, in strategic and tactical applications and radio broadcast.

Antenna Selection

Selection of the appropriate antenna requires a comprehensive understanding of several parameters, including the transmission path, geographic location of the stations, transmission distance and type of radio system. Other considerations include the physical environment, desired grade of service, hours of operation and any required special conditions. Preliminary selection of antenna type can be made utilizing the antenna selection guide on page 146. For further assistance, contact your local Andrew Sales Office listed inside the back cover.

Transmission Lines and Multicouplers

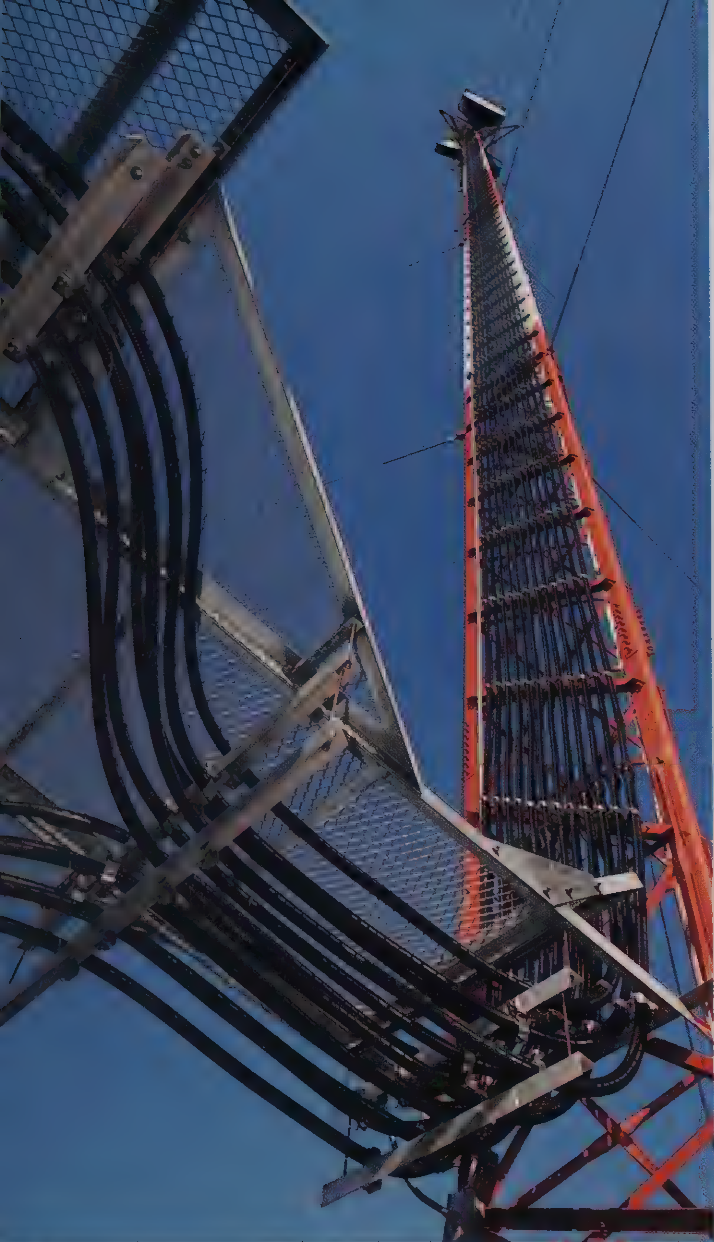
Andrew offers a complete line of HELIAX® air-dielectric and foam-dielectric coaxial cables and related components for use in HF radio systems. Sizes range from 1/4" to 5" in diameter. Refer to pages 210-257 for technical and ordering data. Fixed tuned multicouplers which permit multiple transmitters to radiate through any HF antenna are described on pages 169 and 170.

Components	See Pages
HF Antennas and Equipment	144-171
HELIAX Coaxial Cables and Accessories	210-257
Pressurization Equipment	277-285
Equipment Shelters	301-311
Field Services	43-48

Related Products and Services

Reliable use of the HF spectrum for long-range communications is aided by the availability of real-time frequency management techniques to select the most appropriate frequency assignment. Andrew has developed the Channel Quality Sounder (CQS), described on page 171, to automatically assess the channel characteristics, and is developing other products such as interference cancelling antennas and high-frequency direction finding systems.

Andrew supports customers with worldwide installation and commissioning service for these products which can include propagation analysis and system planning, delivery to site, site civil works, tower erection, antenna installation and testing, maintenance and repair.



Andrew engineers assess the system requirements, and then design the project to meet your requirements. Program Management is available to coordinate the program and maintain communications. Experienced field service crews implement the project, and system testing verifies that all project specifications are achieved.

Systems Management

Andrew Systems Management, which has now completed more than 5,000 projects throughout the world, includes an unmatched combination of skills and capabilities. When applied to your next project, they will ensure that your program requirements will be professionally achieved. Andrew provides a single, qualified source for system preplanning and design, system components, site preparation, installation, testing and maintenance.

At your disposal are the international resources of Andrew Corporation. Andrew has the design, engineering and manufacturing capabilities to produce the highest quality components including HELIAX® elliptical waveguide and coaxial cable, parabolic and horn reflector antennas, earth station antennas, special applications antennas, GRANGER® HF antennas, GRASIS® towers, PLASTIDOME® and concrete equipment shelters, and related ancillary equipment and accessories.

An Andrew Systems Management Program

Begins with . . .	**Preplanning**
Proceeds to . . .	**Design**
Project is coordinated by . . .	**Program Management**
Work is performed . . .	**Implementation**
Then specifications are verified . . .	**Testing/Inspections**
Project is supported by . . .	**Maintenance**
And concludes with . . .	**Customer Satisfaction**

Program Planning and Design

Systems Management application and system engineers provide preplanning assistance to help develop the most cost-effective program tailored to meet your requirements. Preplanning results in a realistic and practical schedule achieved by the optimum design of component interfaces, accurate material lists (eliminating emergency shipments), efficient use of field time, and the selection of components that will best meet the system performance objectives.

Any or all of the following services which help create a successful program are provided by Andrew Systems Management:

- Site and path surveys
- System engineering
- Design engineering
- Applications engineering
- Manufacturing coordination
- Delivery of all materials
- Site civil work
- Integration and implementation
- Complete testing and commissioning services
- Maintenance programs

Program Management

To assure proper control of all the services and components required for your project or turnkey program, Andrew can provide in-house Program Management, fully supported by the latest in computer-aided scheduling and control programs. Program Management maintains communications with all parties for efficient coordination of each facet of your program.

Each project becomes the responsibility of the Program Manager, the master controller and scheduler and your primary contact with Andrew. His Program Management Team is comprised of experienced engineering and support personnel who are assigned to your project for its duration.

The Program Management Team is in direct control of all aspects of your project to integrate the services and system components supplied by Andrew or by others. Andrew Program Management prequalifies subcontractors, if used, and monitors their performance to ensure the integrity of the entire program.

The function of Program Management is simplified with the use of Andrew products whose mechanical and electrical specifications are maintained through rigorous quality assurance procedures. The overall coordination provided saves time and decreases costs by eliminating schedule conflicts, extra personnel, material oversights and the need for subsequent field fixes.

Registered professional engineers use computer-aided analysis to lay out and design towers, shelters and foundations.

Program Management personnel utilize critical path management techniques to schedule and monitor progress on all major projects. Daily status reports from the field and direct involvement with all project planning activity helps assure achievement of all objectives by the Andrew Program Manager.

Team Crew Leaders, Site Superintendents and Field Inspectors provide hands-on supervision to assure that product and service quality meet Andrew's strict standards and the project requirements.

A fleet of more than 100 specialized vehicles, including crane-equipped, over-the-road vehicles of the type shown above provide support for all program related requirements. These vehicles assure personnel and equipment access to remote and hard-to-reach sites. This eliminates additional costs and delays which can be associated with cranes or forklifts, warehouse staging and multiple transfers.

Field Service

Andrew provides complete field services for any type of antenna system including cellular, broadcast, microwave, earth station, or HF.

All equipment and the experienced personnel required for delivery, construction, assembly, installation and testing of your system are available.

Antenna installations by Field Service provide you several advantages. Crews are self-contained and arrive fully equipped. Ongoing inspections and continuous field supervision help yield a maximum effort and proper installation. For example, the following areas relating to

Andrew provides complete site preparation including site clearing and grading, construction of foundations for earth station antennas, towers and equipment buildings, electrical work, installation of fences and construction of access roads.

A 20 ft section of an Andrew M46 tower is hoisted into position using a gin pole (above left) and torqued down (above right) while the gin pole is raised in preparation for the installation of the next section.

Andrew has the capabilities to deliver, install and test communications systems in most areas of the world. Shown here is an HXPD12 High Cross-Polarization Antenna being lifted to the top of the antenna galleries of a tower in London, England.

Helicopter lift of UHX10 antennas with optional white finish to the top of a tower on the CNW building in Chicago, Illinois.

UHX® antenna delivery and assembly are carefully checked during and subsequent to installation:

- Antennas properly staked down after assembly and labeled for identification by installer
- Orientation of mounts according to specifications
- Antenna side strut orientation according to specifications
- UHX feeds installed, right or left, as specified
- Proper clearance for transmission line installation
- Site clean-up and debris disposal after assembly and installation

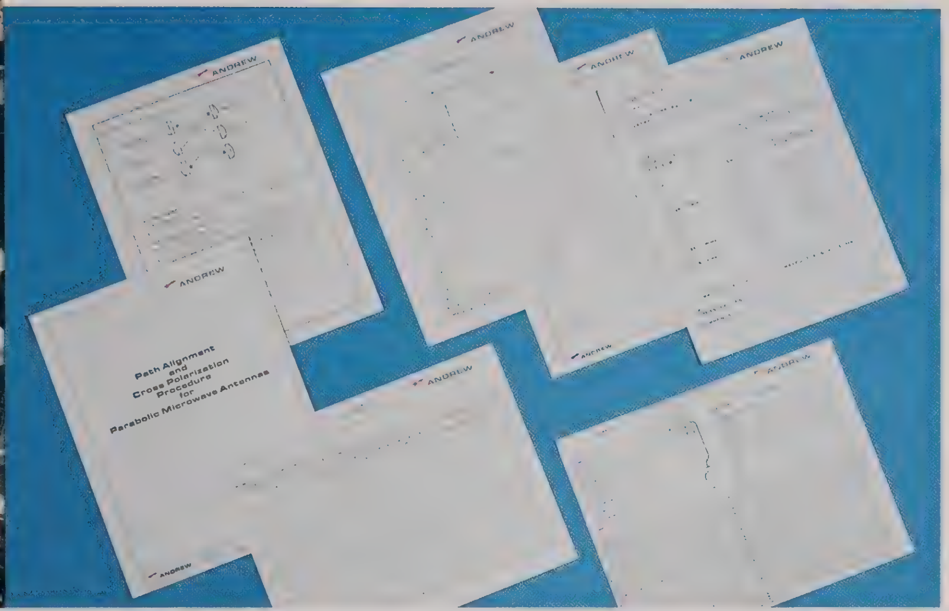
This comprehensive treatment by Andrew's Systems Management for new programs is matched by the planning and design for modifications to existing systems. Care is taken to prepare changeout procedures which will maintain all critical system operations.

Andrew personnel are skilled in establishing temporary antenna/waveguide installations and associated "hot cuts" to allow upgrading existing systems to levels of higher

A sidemount high power UHF TRASAR® antenna is lifted to a pylon on top of the John Hancock building in Chicago, Illinois. Also shown already installed are two Andrew 10 ft (3 m) UHX® Ultra High Performance Antennas with optional bottom struts and white finish to match pylon.

A 7.3-metre receive only earth station antenna being installed in Panama City, Florida. This downlink facility includes a 4.5-metre backup earth station antenna (background) and is part of a domestic television broadcast national distribution system completely installed by Andrew.

Path Alignment of UHX8 antenna using Andrew PAT series transceivers as shown. Precision alignment prior to final waveguide routing ensures optimum feeder performance since minimum handling is required.



Component and system testing are an integral part of all Andrew programs. Activity levels requiring two dozen or more fully equipped installation crews can be accommodated with the department's multi-million dollar collection of the highest quality test equipment.

performance. Literally thousands of these carefully engineered and coordinated installations have been conducted during the past 15 years.

System Testing and Guaranteed Performance

Andrew Field Service test personnel are fully trained to conduct testing procedures using Andrew's comprehensive, up-to-date inventory of test equipment to verify proper performance of all types of antenna systems. Typical formal testing procedures cover return loss, path loss, cross-polarization discrimination and 2° ESA pattern compliancy.

Microwave antennas are aligned and permanently locked into position prior to radio equipment installation. Self-contained proprietary path alignment transceivers are available for all commonly used frequency bands for alignment of new installations when radio equipment is not yet installed.

New or replacement antennas installed on existing routes can be aligned using Andrew-provided spectrum analyzer equipment.

Path loss measurements are verified immediately after antenna alignment so no additional tower-related personnel are required during final system path testing. Cross-polarization levels are also verified during the alignment procedure to assure optimum cross-polarization discrimination performance in high density and digital applications.

Andrew maintains two completely equipped satellite terminals which can provide broadcast quality C-band and Ku-band video/audio signals to verify earth station antenna pattern, VSWR and cross-polarization discrimination using automated, computer-controlled video/audio test equipment. For more information regarding earth station antenna systems, refer to pages 28-31.

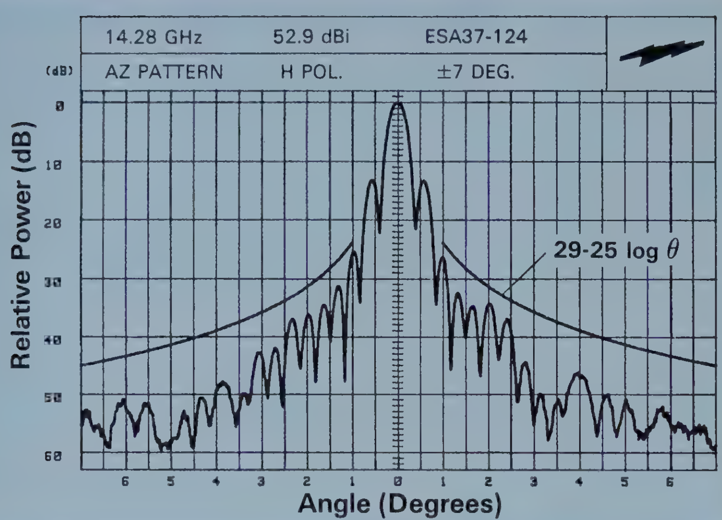
The comprehensive manner in which the quality and capabilities of our products are maintained allows Andrew to guarantee the system performance of your Andrew antenna system. Some of the tests which can be conducted, and the specifications that can be guaranteed, are listed below.

Microwave and Cellular

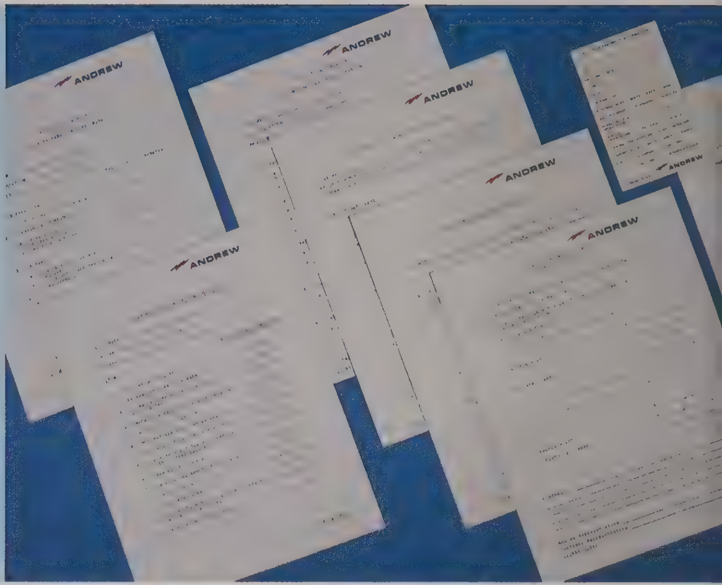
- System return loss in all frequency bands. Our experience with a variety of components and configurations allows Andrew to guarantee the return loss for any system we install. Andrew Hybrid T Reflectometer Test Sets with 60 dB or greater directivity assure measurement accuracy in all common frequency bands. Refer to page 195 for more information on the Andrew Hybrid T Reflectometer.
- Feeder system insertion loss can be verified for all common frequency bands used internationally for HF, cellular or microwave.
- Receive Signal Level using Andrew self-contained alignment transceivers on new installations; Spectrum Analyzers and Power Meters on existing systems.
- Cross-polarization discrimination is accurately determined for UMX® multiband and horn reflector antenna systems utilizing Andrew transceivers, spectrum analyzers, TWT's and LNA's.
- Andrew verifies the pressure integrity of each system it installs.

Earth Station Antennas

- Transmit radiation patterns are guaranteed to comply with U.S. FCC regulation 25-209 for 2° satellite spacing.
- Cross-polarization discrimination
- Return loss for antenna and transmission line
- Noise temperature



Radiation pattern of satellite measured after installation verifying that 3.7-metre Ku-band transmit earth station antenna meets the 29-25 log θ requirements for 2° satellite spacing.



In addition to electrical testing, numerous mechanical inspection checklists are completed to assure conformance with all required specifications and standards.

- Receive/transmit isolation
- Receive/transmit gain
- Baseband video/audio performance

Broadcast

- VSWR for UHF antennas
- VSWR and cross-polarization isolation for UHF circular waveguide systems. Beam orientation and transmission line interface are also verified.
- UHF system pressurization integrity

For additional information regarding typical guarantees on antenna systems, refer to page 7. For additional information regarding earth station system testing, refer to page 5.

Mechanical/Civil Inspections

Site preparation, tower, antenna/waveguide, plus compound and guy fencing are all inspected to confirm each complies with engineering drawings and standards. Typical system inspections which are conducted include verification of the following:

- Site layout conforms to the plot plan
- Excavation work meets stated requirements
- Access roads are constructed and surfaced properly
- Tower structure members are visually inspected prior to assembly and erection
- Tower guy tensions are verified using the stop watch method, a tensionometer or a Dynamometer
- Tower plumb and straightness is verified
- Electrical systems are functional
- Proper installation of antennas and waveguide/waveguide support systems
- Antennas are properly locked down after path alignment
- Compound and guy fence fabric, posts, gates and barbed wire condition
- Grounds are left clean of debris, cable reels are removed and shelter floors are cleaned

The wide range of services and capabilities offered, plus our Program Management, make Andrew's Systems Management the ideal choice for a quality, long-lasting system installation. You can depend on the performance of Andrew products, and the total planning, design and implementation of your Andrew program.

A completed Andrew microwave site installation, professionally installed and implemented by Andrew's Systems Management group.

Microwave Antennas

Andrew offers the industry's most comprehensive line of antennas for point-to-point microwave communication. The extremely wide range of designs permits the system designer to choose an antenna that is optimized for his requirements. More than 500 different antennas are available from this catalog. In choosing an antenna, the following basic parameters should be considered:

Operating Frequency Band. The antennas on pages 58-77 are listed in order of ascending operating frequency. Antennas for simultaneous operation in two or more bands are offered on pages 78-80 and 88-91.

Radiation Patterns are dependent on antenna type and size. The basic antenna types are described on pages 50 and 51. SHX® super high performance antennas have the best radiation patterns available. A comparison of typical patterns for various antenna types is illustrated below. In general, for a given antenna type and frequency band, larger antennas have better radiation patterns.

Gain. In general, larger antennas have higher gain.

Polarization. Most antennas are available in both single and dual-polarized versions. All can be used horizontally or vertically polarized and most have continuous polarization adjustment.

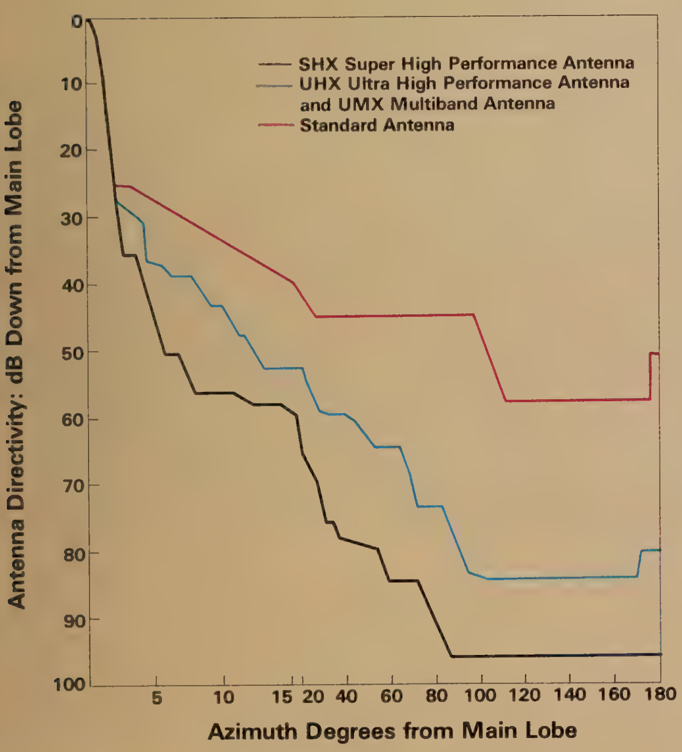
Pressurization. All antennas with air-dielectric coaxial feeds and antennas operating above 3.4 GHz should be pressurized. "F" series antennas eliminate the need for pressurization equipment, since the foam-filled feeds are completely void free and sealed to preclude the presence of moisture. The input is a special void-free, weatherproof flange that mates with "F" series HELIAX® connectors. For further information on this flange, refer to page 241. "F" series antennas are designed for use with HELIAX foam-dielectric coaxial cable and are available for frequency ranges from 1.4 to 2.7 GHz.

Windload. Survival ratings and wind forces for various antenna types and sizes are tabulated on pages 56 and 57. Grid and GRIDPAK™ antennas, available below 2.7 GHz, have significantly lower windload than solid antenna types.

Shipping Considerations. GRIDPAK antennas are shipped disassembled, which results in very small shipping volume. Most 8 ft (2.4 m) and larger solid antennas are available in two piece versions to reduce shipping volume. Refer to the table on page 53.

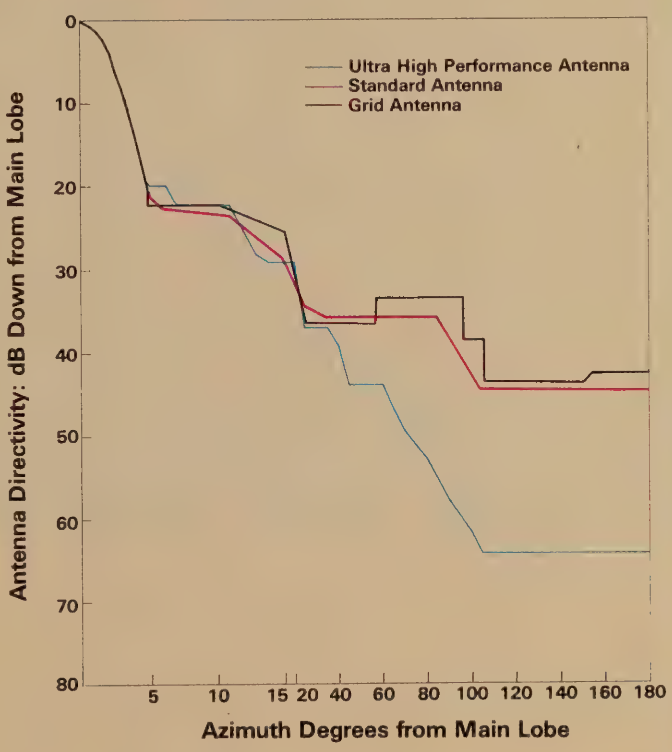
RPE Comparison at 6 GHZ

Typical 10-foot (3.0 m) Antennas



RPE Comparison at 2 GHz

Typical 10-Foot (3.0 m) Antennas




SHX Super High Performance Antenna

Basic Antenna Types

SHX® Super High Performance Antennas offer the best radiation characteristics available, high gain, and capability for multi-frequency operation. These horn-reflector antennas are ideal for use in areas of heavy frequency congestion. SHX antennas are conical in shape, all metal construction and include a TEGLAR® radome. Platform and tower mounts are available and are ordered separately.

UMX® Multiband Antennas provide simultaneous dual-frequency band, dual-polarized operation in the 4/6 GHz, 4/6.5 GHz or 6/11 GHz bands. Size, weight, windload characteristics, and tower interface requirements are similar to other Andrew shielded antennas of equivalent size. They can, in general, be used as direct replacements for existing HP, HPX and UHX series antennas. Multiband antennas offer significant savings in installation and tower costs compared with multiple single-band antennas. In a typical application, a single-band microwave route can be expanded to dual-band operation with minimum tower modification and cost.

UHX® Ultra High Performance Antennas offer high gain, dual polarization, low VSWR and excellent radiation characteristics. These antennas are ideal for applications where frequency congestion is a problem. Their excellent radiation characteristics offer greater flexibility in the planning of microwave routes. UHX antennas include a patented*, low-VSWR, beam-shaping feed, shielded reflector with RF absorbing material, planar radome and a vertical tower mount. Improved UHX II® ultra high performance antennas offer even better performance than previous versions and include a TEGLAR radome.

UHX Ultra High Performance/High XPD Antennas include all the benefits of UHX antennas. In addition, very high cross-polarization discrimination facilitates frequency coordination on high-capacity FM and digital systems. The TEGLAR radome is standard.

HXPD Series Antennas have radiation suppression similar to UHX antennas and very high cross-polarization discrimination. The TEGLAR radome is standard.

High Performance Antennas (HP Series) include shields for improved radiation performance. These antennas are used where frequency plans and system coordination require a high degree of back and side radiation suppression. The antennas include a low-VSWR feed, shielded reflector, planar radome, and a vertical tower mount.

UGX® Ultra Gain Antennas** offer higher gain than UHX and HP Series antennas of equivalent size and have similar radiation suppression characteristics to the HP Series. UGX antennas include a high-efficiency, low-VSWR dual polarized feed, a shielded reflector, planar radome, and a vertical tower mount.

*Patented United States 3,553,707; Canada 873,547; United Kingdom 1,199,226; Australia 417,525.

**Patended United States 3,983,560 and pending in other countries.

Focal Plane Antennas (FP Series) include a deep reflector, low-VSWR patented* beam-shaping feed, vertical tower mount and shields or special edge geometry to achieve pattern performance suitable for use in high-capacity CCIR systems at minimum cost. Focal plane antennas are supplied from our plants in Britain and Australia; they are not stocked in the United States or Canada.

Standard Antennas (P and PL Series) include a standard- or low-VSWR feed, a vertical tower mount and unshielded reflector. They are economical and reliable for use where frequency planning or coordination within or between systems does not require a high degree of back or side radiation suppression. The low-VSWR versions minimize the noise contributed by echo distortion. Radomes are ordered separately for standard antennas.

LD Series Antennas are unshielded antennas designed for use in local distribution systems. A vertical tower mount is included. Radomes are ordered separately.

Shielded Antenna.
(UHX II®, UHX®, UMX®, UGX®, HXPD and HP Series.)

Standard Antenna
(P, PL and LD Series).

Focal Plane Antenna
(FP Series)

GRIDPAK Antenna
(KP Series)

Mini GRIDPAK
Antenna (MKP Series)

Grid Antenna
(GP Series)

GRIDPAK™ Antennas (KP Series) and Mini GRIDPAK Antennas (MKP Series) employ a low-windload grid reflector which is shipped totally disassembled in a lightweight flat package for economical transport. This design was specifically developed to reduce the cost of installations in remote areas. Its configuration and construction eliminate the possibility of fatigue failures. An integral mount is included. GRIDPAK antennas are manufactured at our facilities in Britain and Australia and are stocked at our other manufacturing locations.

Grid Antennas (GP Series) employ welded tube reflectors. 8 ft (2.4 m) and larger sizes are supplied in two sections for reduced shipping and handling cost. Grid construction provides light weight and low windload. Both air-dielectric and foam-filled feeds are available. Vertical tower mounts are included.

Microwave Antenna Feeds

Andrew's product improvement research has produced a new, innovative feed hub which provides several important advantages over previous designs. The new feed hub is fully compatible with existing Andrew microwave antennas and is being phased into the product line.

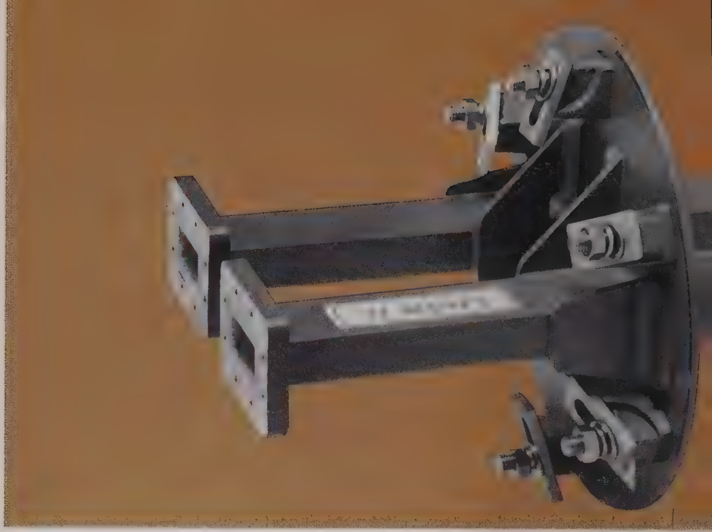
Simplified Installation. The unique new design allows most feeds to be installed from either side of the reflector. This feature permits easy initial installation from the front of the reflector and makes it possible to change or inspect most feeds from the rear of the antenna.

Smooth, Accurate Polarization Adjustment. A conductive compound is used at the reflector/hub interface. The lubricating properties of this compound ensure smooth, accurate feed rotation.

Enhanced Electrical Performance. Positive RF seals at all critical interfaces reduce RF leakage to negligible levels and result in enhanced antenna electrical performance.

Pattern range tests verify that antennas fitted with the new feed hub have improved or equivalent radiation patterns throughout all angular regions.

Improved Resistance to Corrosion. Potential corrosion in all areas critical to antenna system performance is effectively eliminated through the use of electro-chemically compatible materials and corrosion inhibiting compounds. The hub has been salt spray tested for more than 7500 hours and meets the corrosion resistance requirements of U.S. military specifications MIL-F-14072C, MIL-STD-889B and MSFC-SPEC-250A.

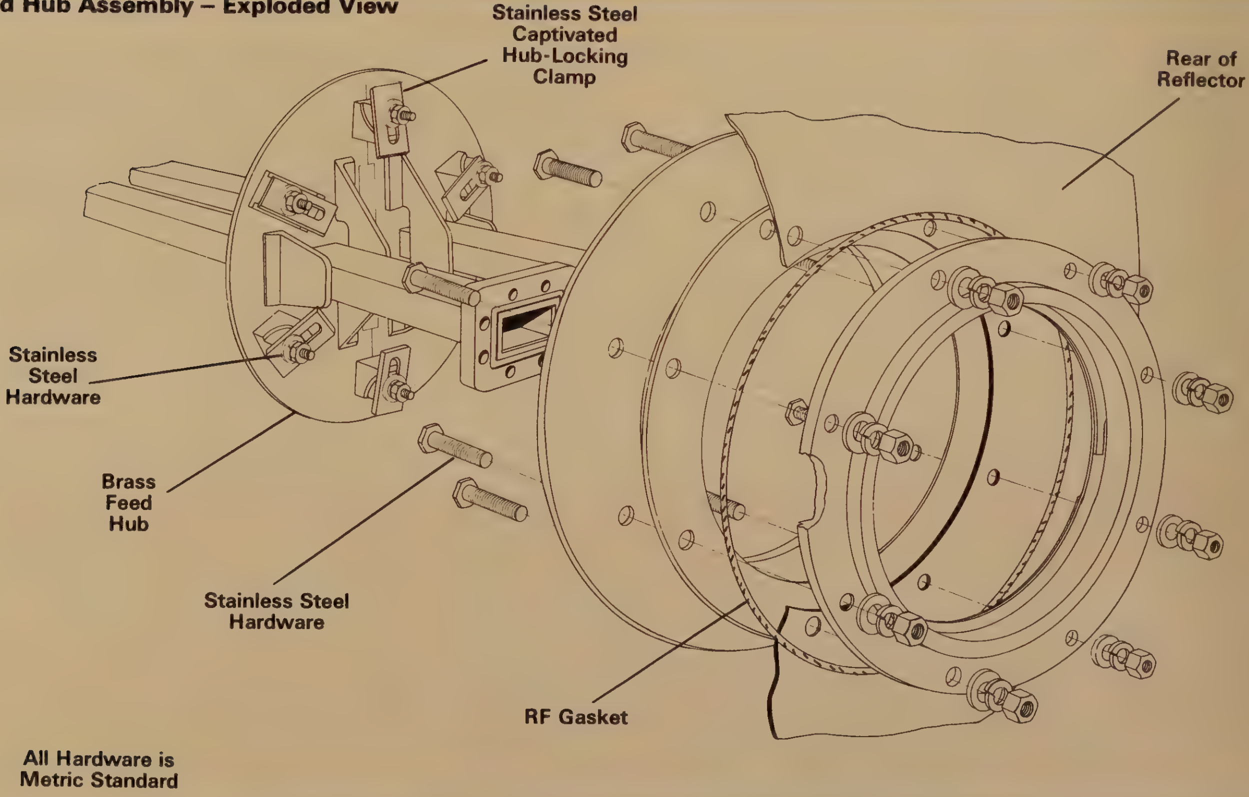


New Feed Hub used on Ultra High Performance, High Performance, Focal Plane and Standard Antennas with Waveguide Feeds

Feed Types. Coaxial feeds are used below 3 GHz and are air- or foam-dielectric type. Horn-reflector antennas have an integral feed horn with a circular waveguide flange input. All other feeds above 3 GHz are terminated with rectangular waveguide flanges. UHX® antennas employ a patented* beamshaping feed design, which illuminates the parabolic reflector efficiently while maintaining sharp cutoff at the edge, resulting in outstanding radiation pattern characteristics without degradation in gain. "F" series antennas have foam-filled feeds that are designed for use with HELIAX® foam-dielectric cable. Guy lines or rods are included with of all feeds, except "LD" series and single-polarized feeds for antennas smaller than 12 ft (3.7 m) where they are unnecessary.

*Patented United States 3,553,707; Canada 873,547; United Kingdom 1,199,226; Australia 417,525.

Feed Hub Assembly – Exploded View



Reflectors

Antennas are supplied with one-piece reflectors, with two- or four-piece reflectors split through the center and bolted together at the site, or completely disassembled (GRIDPAK™ antennas only). Reflector options are dependent on antenna size and point of shipment. Refer to the table below.

Shields

Cylindrical shields, attached to the reflector rim, improve radiation pattern performance for parabolic antennas. RF absorbing material is placed at critical locations inside the shield to reduce unwanted side- and back-lobes.

Radomes

Radomes protect against accumulation of ice, snow and dirt and can be used to reduce windload. Horn-reflector and shielded antennas include a planar radome which is stretched across the opening of the shield. Parabolic, conical or spherical shaped, molded radomes are available for most unshielded antennas as an option. Molded radomes reduce windloading due to their shape.

Mounts

All microwave antennas, except horn reflector and UMX( )-459 series, include a vertical tower mount. Roof, vertical tilt and horizontal tilt mounts are available as options. Mounts are ordered separately for horn reflector and UMX( )-459 series antennas.

Antenna Finish

Standard colors for microwave antennas and radomes are listed in the table below. Other colors in compliance with U.S. FCC and U.S. FAA regulations or special applications are available on request.

Microwave Antenna and Radome Colors

Description	Standard Color
Horn-Reflector Antennas	White or Orange
Horn-Reflector Antenna Radomes	White
Shielded Antennas	Gray
Radomes for Shielded Antennas (except 2 ft)	White
Radomes for Shielded Antennas, 2 ft (0.6 m)	Gray
Standard Antennas	Gray
Molded Radomes	Gray
Grid Antennas	Unpainted aluminum
GRIDPAK™ Antennas	Unpainted aluminum

Standard and Optional Reflectors by Point of Shipment

Antenna Dia. ft (m)	Reflector Type	USA	Australia	Canada	Britain
Solid Antennas					
2 – 6 (0.6 – 1.8)	One-Piece	Standard	Standard	Standard	Standard
8 (2.4)	One-Piece	Standard	Standard	Standard	Standard
8 (2.4)	Two-Piece	Optional	Optional	Optional	Optional
10 (3.0)	One-Piece	Standard	Standard	Standard	Standard
10 (3.0)	Two-Piece	Optional*	Optional*	Optional*	Optional*
12 (3.7)	One-Piece	Optional*	Standard*	Optional*	Optional*
12 (3.7)	Two-Piece	Standard*	Optional*	Standard*	Standard*
15 (4.6)	Two-Piece	Standard	Standard	Standard	Standard
15 (4.6)	Four-Piece	Optional	Optional	Optional	Optional
Grid Antennas					
4 (1.2)	One-Piece	Standard	—	Standard	—
6 (1.8)	One-Piece	Standard	—	—	—
6 (1.8)	Two-Piece	—	—	Standard	—
8 – 15 (2.4 – 4.6)	Two-Piece	Standard	—	Standard	—
GRIDPAK™ Antennas					
All	Knockdown	Standard	Standard	Standard	Standard

*UMX® multiband antennas, Type HPX12-6511C, UGX10 and UHX II (H and J suffix) are available with one-piece reflector only.

Radiation Pattern Envelopes

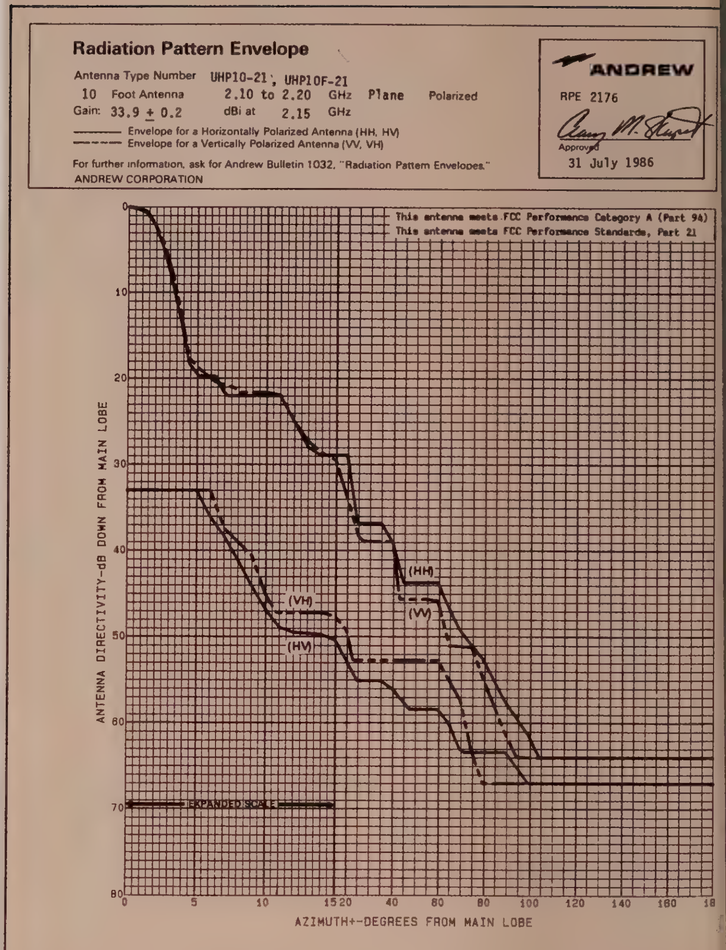
Radiation pattern envelopes (RPE's) published by Andrew present radiation pattern information in a form that is easy to use for planning radio systems. RPE's are available for all production microwave antennas. Copies are on file at the U.S. FCC, Canadian DOC, British Telecom, Telecom Australia, French CNET, and many other administrations throughout the world. U.S. FCC code numbers are assigned to Andrew antennas where applicable.

Andrew RPE's represent the envelope of peaks of radiation patterns, measured on selected units, which accurately represent the antenna type. Parallel and cross-polar patterns are measured across the frequency band for both horizontal and vertical polarizations. Close manufacturing control ensures that this performance is maintained. Actual performance is monitored by measurements on samples from production.

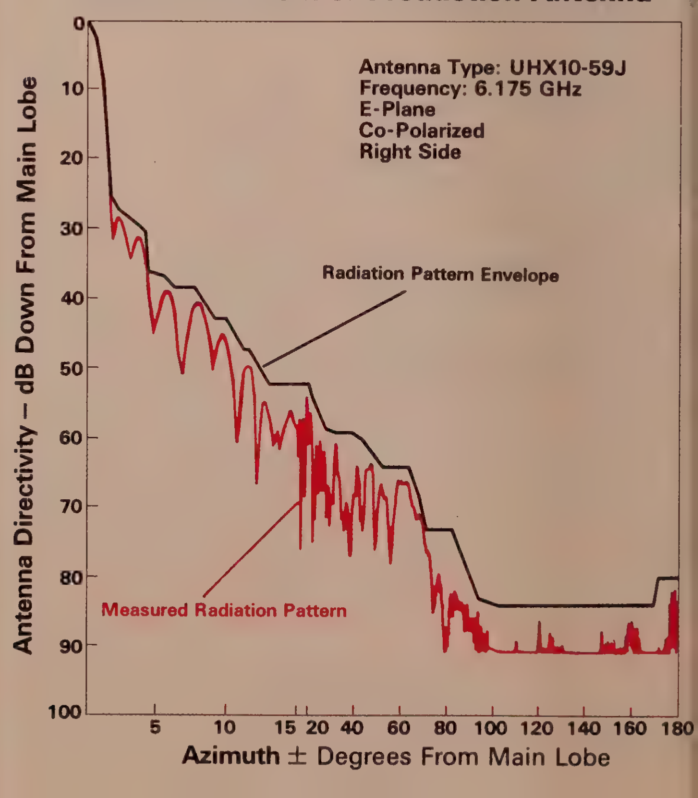
The RPE is the basis for interference calculations. Because the RPE is drawn over the "worst case" peaks of several measurements, the actual interference in an operating system will almost always be better than indicated on the RPE.

UHX® ultra high performance antennas have asymmetrical patterns with lower sidelobe levels on one side. For these antennas, RPE's are prepared for the full 360°. The frequency coordinator can use the superior half of the radiation pattern on either the right or left side of the antenna boresight to reduce potential interference. Half of the UHX feed hub is painted red to identify the superior side and the hub can be rotated so as to place this side either right or left of boresight.

Guaranteed Radiation Pattern Envelopes. Actual radiation patterns for production antennas will not have any peak exceeding the current RPE by more than 3 dB from 0° to 100°, excluding the co-polarized main beam, and 2 dB from 100° to 180°. An angular accuracy of ±1° is maintained throughout. This guarantee applies to all Andrew parabolic microwave antennas unless otherwise stated on the RPE.



Comparison of RPE with Typical Measured Radiation Pattern of Production Antenna



Electrical Definitions

The following terms describe the electrical characteristics for Andrew microwave antennas. All rated electrical characteristics listed in the tables are guaranteed to be within the tolerances stated below.

Frequency refers to the operating frequency band. These bands correspond with CCIR recommendations or common allocations used in the United States or Canada. It is usually possible to tune antennas for slightly different frequency ranges while retaining the same electrical characteristics. Other ranges can be accommodated on special order.

VSWR, Maximum, is the guaranteed peak voltage-standing-wave-ratio within the operating band.

Isolation between inputs of single-band, dual-polarized antennas is 35 dB minimum unless otherwise specified.

Gain is stated in dBi (decibels over an isotropic radiator) at three frequencies: bottom, middle and top of band. Tolerance for antenna gain is 0.2 dB unless otherwise specified. In the case of two-port, dual-polarized antennas, the specified gain refers to the average gain of the two ports, the gain of each port differing from the average gain by not more than 0.3 dB.

Front-to-Back Ratio in decibels. For high performance, SHX®, UHX II®, UHX®, HXPD, UMX® and UGX® antennas, denotes highest radiation relative to the main beam, at 180° ±80°, across the band. For all other antennas, the ratio applies to the region 180° ±40°. Production antennas do not exceed rated values by more than 2 dB unless stated otherwise.

Half-Power Beamwidth is the nominal total width of the main beam at the −3 dB points.

Cross-Polarization Discrimination, in dB, is the difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam. For SHX super high performance antennas, cross-polarization discrimination is specified at the boresight null and over an angle ±2° from boresight.

Power Rating. All microwave antenna feeds are rated at 150 watts. Antennas for higher power applications are available on special order.

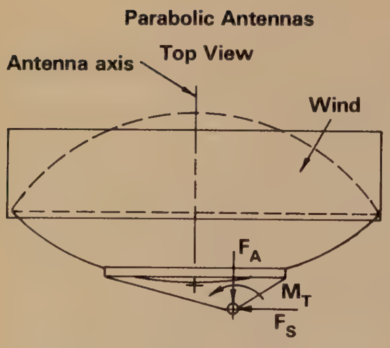
Environmental Ratings

Standard Ratings. Microwave antennas, including mounts and radomes, where applicable, will withstand the wind and ice conditions specified in the table below. Except where noted otherwise in the antenna listings, all antennas will remain operational within a temperature range of −40°C to 50°C (−40°F to 122°F), and meet all other requirements of EIA Standards RS-222C and RS-195B.

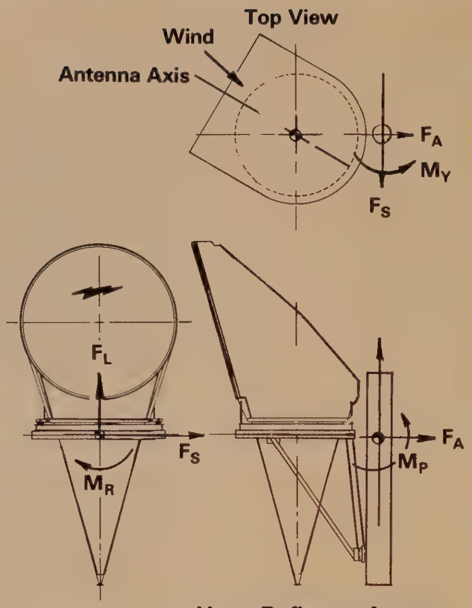
Increased Ratings. Antennas with substantially increased ratings are available for use in severe environments. In many cases, addition of a bottom strut increases the wind survival rating to 150 mph (240 km/h) as indicated in the table below. Special environment antennas are described on page 92. Contact your local Andrew Sales Office listed inside the back cover for further information.

Environmental Characteristics

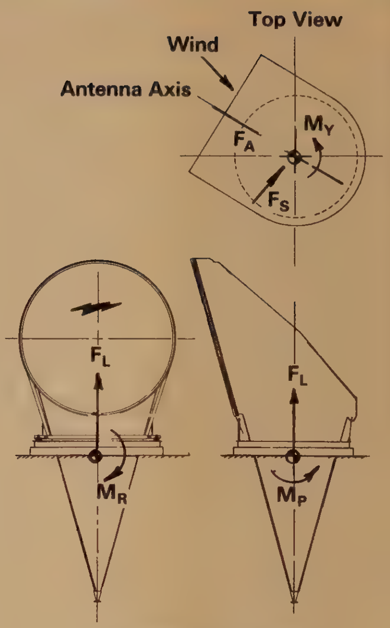
Antenna Types	Survival Ratings: Wind Velocity mph (km/h)	Survival Ratings: Radial Ice, in (mm)	Max. Deflection in 70 mph (110 km/h) Wind, degrees
P4F, LD2 and LD4 Series			
Without Radome	100 (160)	0.5 (12)	0.1
With Radome	115 (185)	0.5 (12)	0.1
Standard Antennas (except those listed above), LD6			
Without Radome	125 (200)	1 (25)	0.1
With Standard Radome	125 (200)	1 (25)	0.1
With Extra Strength Radome	150 (240)	1 (25)	0.1
UHX®, UMX®, UGX® and High Performance Antennas			
Without Optional Bottom Strut	125 (200)	1 (25)	0.1
With Optional Bottom Strut (8 – 12 ft dia.)	150 (240)	1 (25)	0.1
SHX® Antennas	125 (200)	1 (25)	0.025
Grid Antennas	125 (200)	—	0.1
GRIDPAK™ Antennas	125 (200)	—	—



For parabolic antennas:
- F_A, axial force
- F_S, side force
- M_T, twisting moment



Horn-Reflector Antenna with Tower Mount



Horn-Reflector Antenna with Platform Mount

Wind Forces

Wind effects can be separated into force and twisting moment components as shown in the diagrams above. Specific values are tabulated below. In every case, the value is a maximum absolute value and is the result of wind from the worst direction for each parameter. (The individual maximums do not occur simultaneously.) For further information, contact your local Andrew Sales Office listed inside the back cover. For parabolic antennas, ask for Bulletin 1015; for horn reflector antennas, ask for SP20-05.

For horn-reflector antennas:
- F_A, axial force
- F_S, side force
- F_L, vertical force (including antenna weight and 1" ice)
- M_Y, yawing moment
- M_R, rolling moment
- M_P, pitching moment

Wind Forces at 125 mph (200 km/h)

Antenna Type	Antenna Dia. ft (m)	F_A Max. lb (N)	F_S Max. lb (N)	M_T Max. ft-lb (N·m)
Shielded Antenna with Planar Radome (except "Other" Shielded" shown below)	2 (0.6)	160 (710)	80 (360)	110 (150)
	4 (1.2)	640 (2850)	315 (1400)	690 (940)
	6 (1.8)	1440 (6410)	680 (3020)	1750 (2370)
	8 (2.4)	2560 (11390)	1200 (5340)	3570 (4840)
	10 (3.0)	4000 (17790)	1880 (8360)	6260 (8490)
	12 (3.7)	5760 (25620)	2700 (12010)	10240 (13890)
	15 (4.6)	9000 (40030)	4230 (18820)	21840 (29620)
Other Shielded, with Planar Radome				
UHX10-59J	10 (3.0)	4000 (17790)	1910 (8500)	6880 (9330)
UMX10-459	10 (3.0)	4000 (17790)	1970 (8760)	10100 (13700)
UMX10-611	10 (3.0)	4000 (17790)	1880 (8360)	6260 (8490)
UHX12-59J	12 (3.7)	5800 (25800)	3020 (13430)	13610 (18450)
UMX12-459	12 (3.7)	5760 (25620)	2830 (12590)	13400 (18170)
UMX12-465	12 (3.7)	5910 (26290)	3210 (14280)	15590 (21140)
Focal Plane Antenna without Radome	4 (1.2)	870 (3875)	305 (1355)	710 (960)
	6 (1.8)	1950 (8680)	690 (3090)	1990 (2695)
	8 (2.4)	3460 (15400)	1240 (5495)	4650 (6310)
	10 (3.0)	5400 (24030)	1930 (8570)	8130 (11030)
	12 (3.7)	7810 (34720)	2780 (12360)	13410 (18185)
Focal Plane Antenna with Radome	4 (1.2)	450 (2010)	310 (1375)	650 (880)
	6 (1.8)	1010 (4510)	710 (3160)	1880 (2550)
	8 (2.4)	1790 (7945)	1240 (5525)	4270 (5785)
	10 (3.0)	2800 (12455)	1930 (8585)	7880 (10685)
	12 (3.7)	4040 (17950)	2790 (12405)	13230 (17940)

Wind Forces at 125 mph (200 km/h)

Antenna Type	Antenna Dia. ft (m)	F_A Max. lb (N)	F_S Max. lb (N)	M_T Max. ft-lb (N·m)
Standard Antenna without Radome (except LD2, PF4 and LD4 Series)	2 (0.6)	215 (960)	60 (270)	100 (140)
	4 (1.2)	870 (3870)	240 (1070)	615 (830)
	6 (1.8)	1950 (8670)	530 (2360)	1730 (2350)
	8 (2.4)	3460 (15390)	950 (4230)	3940 (5340)
	10 (3.0)	5410 (24060)	1480 (6580)	7080 (9600)
	12 (3.7)	7800 (34690)	2130 (9470)	11680 (15840)
	15 (4.6)	12170 (54130)	3330 (14680)	24400 (33090)
Standard Antenna with Radome (except LD2, PF4 and LD4 Series)	2 (0.6)	110 (490)	70 (310)	80 (110)
	4 (1.2)	450 (2000)	270 (1200)	565 (770)
	6 (1.8)	1010 (4490)	610 (2710)	1650 (2240)
	8 (2.4)	1790 (7960)	1075 (4780)	3720 (5040)
	10 (3.0)	2800 (12450)	1680 (7470)	6880 (9330)
	12 (3.7)	4030 (17930)	2420 (10760)	11520 (15620)
Grid Antenna without ice GP and GPL Series (except 890 Series)	4 (1.2)	320 (1420)	155 (690)	305 (410)
	6 (1.8)	640 (2850)	355 (1580)	830 (1130)
	8 (2.4)	1115 (4960)	620 (2760)	1830 (2480)
	10 (3.0)	1745 (7760)	970 (4310)	3230 (4380)
	12 (3.7)	2550 (11340)	1420 (6320)	6490 (8800)
	15 (4.6)	3925 (17460)	2185 (9720)	11850 (16070)
Grid Antenna without ice GP-890 Series	4 (1.2)	305 (1360)	155 (690)	305 (410)
	6 (1.8)	480 (2140)	300 (1330)	710 (960)
	8 (2.4)	840 (3740)	530 (2360)	1560 (2120)
	10 (3.0)	1310 (5830)	820 (3650)	2750 (3730)
	12 (3.7)	1910 (8500)	1210 (5380)	5520 (7480)
GRIDPAK™ Antenna without ice KP Series (-15, -17, -19, -23, -25 Series)	4 (1.3)	355 (1580)	175 (780)	420 (570)
	6 (2)	820 (3650)	430 (1910)	1240 (1680)
	8 (2.4)	1180 (5250)	600 (2670)	2030 (2750)
	10 (3)	1825 (8120)	1020 (4540)	3490 (4730)
	13 (4)	3135 (13940)	1750 (7780)	7100 (9630)
GRIDPAK Antenna without ice KP Series (-820 Series)	6 (2)	680 (3020)	595 (2650)	740 (1000)
	10 (3)	1310 (5830)	1250 (5560)	1890 (2560)
	13 (4)	2140 (9520)	2030 (9030)	3725 (5050)
GRIDPAK Antenna without ice KP Series (-335, -365, -403 Series)	6 (2)	585 (2600)	490 (2180)	625 (850)
	10 (3)	1095 (4870)	970 (4310)	1490 (2020)
	13 (4)	1750 (7780)	1600 (7120)	3040 (4120)

Wind Forces at 100 mph (160 km/h)

Antenna Types	Antenna Dia. ft (m)	F_A Max. lb (N)	F_S Max. lb (N)	M_T Max. ft-lb (N·m)
LD2 Series without Radome	2 (0.6)	140 (620)	40 (180)	65 (90)
LD2 Series with Radome	2 (0.6)	70 (310)	45 (200)	50 (70)
P4F and LD4 Series without Radome	4 (1.2)	560 (2490)	155 (690)	395 (535)
P4F and LD4 Series with Radome	4 (1.2)	290 (1290)	175 (780)	365 (495)

Wind Forces at 125 mph (200 km/h) – Horn Reflector Antennas

Mount Type	F_A Max. lb (N)	F_S Max. lb (N)	F_L Max. lb (N)	M_Y Max. ft-lb (N·m)	M_R Max. ft-lb (N·m)	M_P Max. ft-lb (N·m)
Platform	4850 (2160)	3145 (13990)	–7882 (–35060)	5820 (7890)	14785 (20045)	34030 (46140)
Tower*	4850 (2160)	4850 (2160)	–8930 (–39720)	22490 (30500)	44250 (59995)	60220 (81650)

*Maximum loading for the maximum azimuth range of ±90°.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

U.K. Home Office Specification. The -15 Series 4, 6 and 8 ft (1.2, 1.8 and 2.4 m) focal plane antennas comply with the U.K. Home Office Specification for antennas to be used in the 1500 MHz Sub-Band B.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Air-dielectric feeds are pressurizable to 10 lb/in^2 (70 kPa). Unpressurized feeds are foam filled and eliminate the need for pressurization equipment.

To Order. Specify *Antenna Type Number.* Refer to page 93 for general ordering information.

KP6-15A, 6 ft (1.8 m) GRIDPAK Antenna with Integral Vertical Tower Mount

335-365, 365-403, 403-470, 820-960 MHz Antennas — Electrical Characteristics

Frequency MHz	Inputs Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Vertical	Beamwidth Horizontal	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
GRIDPAK™ and Mini GRIDPAK Antennas, Unpressurized											
335-365 GRIDPAK	Type N Plug	**KP6-335A**	6 (2.0)	15.0	15.2	15.4	25.0	30.0	23	19	1.3 (17.7)
		KP10-335A	10 (3.0)	18.3	18.4	18.6	16.0	19.0	23	22	1.3 (17.7)
		KP13-335B	13 (4.0)	20.6	20.7	20.7	12.0	14.5	25	23	1.3 (17.7)
335-365 Mini GRIDPAK	Type N Plug	**MKP-335A**	6.6 x 3.3 (2 x 1)	11.0	11.0	11.0	28	37	15	9	1.5 (14.0)
365-403 GRIDPAK	Type N Plug	**KP6-365A**	6 (2.0)	15.8	16.3	16.3	22.0	27.0	29	20	1.3 (17.7)
		KP10-365A	10 (3.0)	18.7	19.4	19.6	15.0	18.5	33	23	1.3 (17.7)
		KP13-365B	13 (4.0)	21.0	21.8	21.9	11.0	14.5	33	24	1.3 (17.7)
403-470 GRIDPAK	Type N Plug	**KP6-403A**	6 (2.0)	16.4	16.3	16.6	22.0	25.0	27	20	1.35 (16.5)
		KP10-403A	10 (3.0)	20.0	19.6	20.4	14.0	14.0	30	22	1.35 (16.5)
		KP13-403B	13 (4.0)	22.0	22.2	22.6	13.0	13.0	30	24	1.35 (16.5)
403-470 Mini GRIDPAK	Type N Plug	**MKP-403A**	6.6 x 3.3 (2 x 1)	13.5	13.5	13.5	22	29	17	19	1.35 (16.5)
820-960 GRIDPAK	Type N Plug	**KP6-820A**	6 (2.0)	21.1	22.7	22.4	10.0	13.0	28	23	1.4 (15.5)
		KP10-820A	10 (3.0)	24.9	25.8	25.7	8.5	8.5	30	25	1.35 (16.5)
		KP13-820B	13 (4.0)	26.9	28.1	28.4	5.0	5.5	36	30	1.35 (16.5)
820-960 Mini GRIDPAK	Type N Plug	**MKP-820B**	6.6 x 3.3 (2 x 1)	18.0	18.2	18.5	10.0	20.0	20	15	1.5 (14.0)

890-960 MHz Antennas – Electrical Characteristics

Frequency MHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category*	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Standard Antennas, Air Dielectric											
890-960 Single Polarized	7/8" EIA 50 ohm	**P4-9C**	4 (1.2)	B	18.1	18.4	18.7	19.5	8	21	1.3 (17.7)
		P6-9C	6 (1.8)	A	21.6	22.0	22.3	13.0	12	24	1.3 (17.7)
		P8-9C	8 (2.4)	A	24.1	24.4	24.8	9.8	15	27	1.3 (17.7)
		P10-9C	10 (3.0)	A	26.1	26.4	26.7	7.8	15	29	1.3 (17.7)
		P12-9E	12 (3.7)	A	27.7	28.0	28.3	6.5	15	30	1.3 (17.7)
		P15-9D	15 (4.6)	A	29.6	29.9	30.2	5.3	16	32	1.3 (17.7)
Grid Antennas, Unpressurized											
890-960 Single Polarized	"F" Flange Male	**GP4F-890A**	4 (1.2)	B	18.9	19.1	19.3	18.5	15	20	1.3 (17.7)
		GP6F-890A	6 (1.8)	A	21.5	21.9	22.2	13.0	25	24	1.3 (17.7)
		GP8F-890A	8 (2.4)	A	23.9	24.3	24.7	9.8	26	26	1.3 (17.7)
		GP10F-890A	10 (3.0)	A	25.9	26.3	26.7	7.8	27	29	1.3 (17.7)
		GP12F-890	12 (3.7)	A	27.5	27.9	28.2	6.5	29	30	1.3 (17.7)

*Part 94

1.427 – 1.535 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
F-Series Focal Plane Antennas, Unpressurized*										
1.427-1.535 Single Polarized	"F" Flange Male	**FP4F-15E**	4 (1.2)	21.4	22.0	22.5	12.1	30	38	1.3 (17.7)
		FP6F-15E	6 (1.8)	25.7	25.8	25.9	8.0	30	41	1.3 (17.7)
		FP8F-15E	8 (2.4)	28.9	29.1	29.4	6.1	30	46	1.3 (17.7)
		FP10F-15D	10 (3.0)	30.2	30.6	30.9	4.7	26	38	1.3 (17.7)
		FP12F-15D	12 (3.7)	31.3	31.8	32.2	4.2	26	40	1.3 (17.7)
Standard Antennas, Air Dielectric										
1.427-1.535 Single Polarized	7/8" EIA 50 ohm	**P4-15C**	4 (1.2)	22.6	23.0	23.3	11.6	30	30	1.15 (23.1)
		P6-15C	6 (1.8)	26.1	26.5	26.8	7.8	30	32	1.10 (26.4)
		P8-15C	8 (2.4)	28.6	29.0	29.3	5.8	30	34	1.10 (26.4)
		P10-15C	10 (3.0)	30.6	31.0	31.3	4.7	30	36	1.10 (26.4)
F-Series Standard Antennas, Unpressurized										
1.427-1.535 Single Polarized	"F" Flange Male	**P4F-15D**	4 (1.2)	22.6	23.0	23.3	11.6	30	30	1.3 (17.7)
		P6F-15D	6 (1.8)	26.1	26.5	26.8	7.8	30	32	1.3 (17.7)
		P8F-15D	8 (2.4)	28.6	29.0	29.3	5.8	30	34	1.3 (17.7)
		P10F-15D	10 (3.0)	30.6	31.0	31.3	4.7	30	36	1.3 (17.7)
GRIDPAK™ Antennas, Air Dielectric										
1.427-1.535 Single Polarized	7/8" EIA 50 ohm	**KP4-15**	4 (1.2)	23.2	23.5	23.8	11.0	31	28	1.3 (17.7)
		KP6-15A	6 (2.0)	26.9	27.2	27.5	7.2	32	31	1.2 (20.8)
		KP8-15	8 (2.4)	28.5	28.8	29.1	6.2	30	32	1.2 (20.8)
		KP10-15B	10 (3.0)	30.5	30.8	31.1	4.7	34	33	1.15 (23.1)
		KP13-15	13 (4.0)	32.9	33.2	33.5	3.8	30	40	1.15 (23.1)
F-Series GRIDPAK Antennas, Unpressurized										
1.427-1.535 Single Polarized	"F" Flange Male	**KP4F-15**	4 (1.2)	23.1	23.4	23.7	11.0	31	28	1.35 (16.5)
		KP6F-15A	6 (2.0)	26.8	27.1	27.4	7.2	32	31	1.3 (17.7)
		KP8F-15	8 (2.4)	28.4	28.7	29.0	6.2	30	32	1.2 (20.8)
		KP10F-15B	10 (3.0)	30.4	30.7	31.0	4.7	34	33	1.2 (20.8)
		KP13F-15	13 (4.0)	32.8	33.1	33.4	3.8	30	40	1.2 (20.8)

*Focal plane antennas are manufactured and stocked at our factory in Great Britain and manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Single polarized air-dielectric feeds are pressurizable to 10 lb/in^2 (70 kPa). Dual polarized feeds are pressurizable to 3 lb/in^2 (20 kPa). F Series unpressurized feeds are foam filled and eliminate the need for pressurization equipment.

To Order. Specify *Antenna Type Number.* Refer to page 93 for general ordering information.

1.7 – 2.11 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas, Air Dielectric – Planar Radome Included											
1.7-2.11* Single Polarized	7/8" EIA 50 ohm	**HP6-17C**	6 (1.8)	B	27.8	28.7	29.6	6.0	25	44	1.10 (26.4)
		HP8-17D	8 (2.4)	A	30.3	31.2	32.1	4.5	30	50	1.06 (30.7)
		HP10-17D	10 (3.0)	A	32.2	33.2	34.1	3.7	34	52	1.06 (30.7)
		HP12-17E	12 (3.7)	A	33.8	34.7	35.6	3.0	30	56	1.06 (30.7)
		HP15-17D	15 (4.6)	A	35.7	36.6	37.5	2.4	30	58	1.06 (30.7)
High Performance Antennas, F-Series Unpressurized – Planar Radome Included											
1.7-2.11* Single Polarized	"F" Flange Male	**HP6F-17C**	6 (1.8)	B	27.7	28.6	29.6	6.0	25	44	1.20 (20.8)
		HP8F-17C	8 (2.4)	A	30.2	31.1	32.0	4.5	30	50	1.15 (23.1)
		HP10F-17C	10 (3.0)	A	32.1	33.1	34.1	3.7	34	52	1.15 (23.1)
		HP12F-17C	12 (3.7)	A	33.7	34.6	35.6	3.0	30	56	1.15 (23.1)
Focal Plane Antennas, Air Dielectric* **											
1.7-2.11* Single Polarized	7/8" EIA 50 ohm	**FP8-17D**	8 (2.4)	—	30.0	30.9	32.0	4.6	30	49	1.08 (28.3)
		FP10-17D	10 (3.0)	—	32.0	32.9	33.9	3.7	30	51	1.07 (29.4)
		FP12-17D	12 (3.7)	—	33.7	34.4	35.4	3.1	30	54	1.07 (29.4)
1.7-2.11† Dual Polarized	7/8" EIA 50 ohm	**FPX8-17**	8 (2.4)	—	29.4	30.4	31.2	4.6	28	45	1.10 (26.4)
		FPX10-17	10 (3.0)	—	31.5	32.3	33.1	3.7	30	50	1.08 (28.3)
		FPX12-17	12 (3.7)	—	33.3	34.0	34.8	3.2	29	52	1.08 (28.3)
Focal Plane Antennas, F-Series Unpressurized* **											
1.7-2.11* Single Polarized	"F" Flange Male	**FP8F-17D**	8 (2.4)	—	29.9	30.8	31.9	4.6	30	49	1.20 (20.8)
		FP10F-17D	10 (3.0)	—	31.9	32.8	33.8	3.7	30	51	1.15 (23.1)
		FP12F-17D	12 (3.7)	—	33.6	34.3	35.3	3.1	30	54	1.15 (23.1)
Low VSWR Standard Antennas, Air Dielectric											
1.7-2.11* Single Polarized	7/8" EIA 50 ohm	**PL6-17C**	6 (1.8)	B	27.8	28.7	29.6	6.0	30	36	1.10 (26.4)
		PL8-17C	8 (2.4)	A	30.3	31.2	32.1	4.5	30	39	1.06 (30.7)
		PL10-17C	10 (3.0)	A	32.2	33.2	34.1	3.7	34	42	1.06 (30.7)
		PL12-17E	12 (3.7)	A	33.8	34.7	35.6	3.0	30	45	1.06 (30.7)
		PL15-17D	15 (4.6)	A	35.7	36.6	37.5	2.4	30	48	1.06 (30.7)
Standard Antennas, F-Series Unpressurized											
1.7-2.11* Single Polarized	"F" Flange Male	**P6F-17C**	6 (1.8)	B	27.7	28.6	29.5	6.0	30	36	1.20 (20.8)
		P8F-17C	8 (2.4)	A	30.2	31.1	32.0	4.5	30	39	1.15 (23.1)
		P10F-17C	10 (3.0)	A	32.1	33.1	34.0	3.7	34	42	1.15 (23.1)
		P12F-17C	12 (3.7)	A	33.7	34.6	35.5	3.0	30	45	1.15 (23.1)
Grid Antennas, Air Dielectric											
1.7-2.11* Single Polarized	7/8" EIA 50 ohm	**GPL6-17A**	6 (1.8)	B	27.6	28.6	29.5	5.6	33	36	1.10 (26.4)
		GPL8-17A	8 (2.4)	A	30.2	31.1	32.0	4.2	37	39	1.08 (28.3)**
		GPL10-17A	10 (3.0)	A	32.0	33.0	33.9	3.4	40	42	1.08 (28.3)**
		GPL12-17A	12 (3.7)	A	33.6	34.6	35.5	2.9	40	44	1.08 (28.3)**
		GPL15-17A	15 (4.6)	A	35.5	36.5	37.4	2.3	40	46	1.08 (28.3)**

*Specify operating band.
†Specify 200 MHz band. VSWR for 400 MHz band is 1.15 (23.1).
**1.06 (30.7) available on request.
‡Part 94.

***Focal plane antennas are manufactured at our factories in Great Britain and Australia. They are not manufactured or stocked in the United States or Canada.

1.7 – 2.11 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Grid Antennas, F-Series Unpressurized											
1.7-2.11* Single Polarized	"F" Flange Male	GP4F-17	4 (1.2)	—	24.3	25.3	26.2	8.6	32	30	1.20 (20.8)
		GP6F-17A	6 (1.8)	B	27.5	28.5	29.4	5.6	33	37	1.20 (20.8)
		GP8F-17A	8 (2.4)	A	30.0	31.0	31.9	4.2	37	39	1.20 (20.8)
		GP10F-17A	10 (3.0)	A	31.9	32.9	33.8	3.4	40	42	1.20 (20.8)
		GP12F-17	12 (3.7)	A	33.5	34.5	35.4	2.9	40	44	1.20 (20.8)
		GP15F-17	15 (4.6)	A	35.4	36.4	37.3	2.3	40	46	1.20 (20.8)
GRIDPAK® Antennas, Air Dielectric											
1.7-2.11* Single Polarized	7/8" EIA 50 ohm	KP4-17	4 (1.2)	—	24.7	25.6	26.5	8.6	31	32	1.20 (20.8)
		KP6-17	6 (2.0)	B	28.4	29.4	30.3	5.5	33	36	1.10 (26.4)
		KP8-17	8 (2.4)	B	30.2	31.2	31.8	4.8	32	36	1.08 (28.3)
		KP10-17	10 (3.0)	A	32.0	32.9	33.8	3.7	38	42	1.08 (28.3)
		KP13-17	13 (4.0)	A	34.4	35.4	36.3	3.0	30	40	1.08 (28.3)
GRIDPAK Antennas, F-Series Unpressurized											
1.7-2.11* Single Polarized	"F" Flange Male	KP4F-17	4 (1.2)	—	24.6	25.5	26.4	8.6	31	32	1.30 (17.7)
		KP6F-17	6 (2.0)	B	28.3	29.3	30.2	5.5	33	36	1.20 (20.8)
		KP8F-17	8 (2.4)	B	30.1	31.1	31.7	4.8	32	36	1.20 (20.8)
		KP10F-17	10 (3.0)	A	31.9	32.8	33.7	3.7	38	42	1.20 (20.8)
		KP13F-17	13 (4.0)	A	34.3	35.3	36.2	3.0	30	40	1.20 (20.8)

*Specify operating band. ‡ Part 94.

1.85 – 1.99 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas, Air Dielectric – Planar Radome Included											
1.85-1.99 Single Polarized	7/8" EIA 50 ohm	HP6-18	6 (1.8)	B	28.5	28.8	29.1	6.0	25	44	1.10 (26.4)
		HP8-18	8 (2.4)	A	31.0	31.3	31.6	4.5	30	50	1.06 (30.7)
		HP10-18	10 (3.0)	A	33.0	33.3	33.6	3.7	34	52	1.06 (30.7)
		HP12-18	12 (3.7)	A	34.5	34.8	35.1	3.0	30	56	1.06 (30.7)
High Performance Antennas, F-Series Unpressurized – Planar Radome Included											
1.85-1.99 Single Polarized	"F" Flange Male	HP6F-18	6 (1.8)	B	28.4	28.7	29.0	6.0	25	44	1.10 (26.4)
		HP8F-18	8 (2.4)	A	30.9	31.2	31.5	4.5	30	50	1.06 (30.7)
		HP10F-18	10 (3.0)	A	32.9	33.2	33.5	3.7	34	52	1.06 (30.7)
		HP12F-18	12 (3.7)	A	34.4	34.7	35.0	3.0	30	56	1 06 (30.7)
Low VSWR Standard Antennas, Air Dielectric											
1.85-1.99 Single Polarized	7/8" EIA 50 ohm	PL6-18	6 (1.8)	B	28.5	28.8	29.1	6.0	30	36	1.10 (26.4)
		PL8-18	8 (2.4)	A	31.0	31.3	31.6	4.5	30	39	1.06 (30.7)
		PL10-18	10 (3.0)	A	33.0	33.3	33.6	3.7	34	42	1.06 (30.7)
		PL12-18	12 (3.7)	A	34.5	34.8	35.1	3.0	30	45	1.06 (30.7)
1.85-1.99† Dual Polarized	7/8" EIA 50 ohm	PXL8-18C	8 (2.4)	A	31.0	31.2	31.5	4.6	28	43	1.08 (28.3)
		PXL10-18C	10 (3.0)	A	32.9	33.1	33.6	3.7	28	46	1.08 (28.3)
		PXL12-18C	12 (3.7)	A	34.5	34.7	35.2	3.0	28	48	1.08 (28.3)
Standard Antennas, F-Series Unpressurized											
1.85-1.99 Single Polarized	"F" Flange Male	P6F-18C	6 (1.8)	B	28.4	28.7	29.0	6.0	30	36	1.15 (23.1)
		P8F-18C	8 (2.4)	A	30.9	31.2	31.5	4.5	30	39	1.15 (23.1)
		P10F-18C	10 (3.0)	A	32.9	33.2	33.5	3.7	34	42	1.15 (23.1)
Grid Antennas, Air Dielectric											
1.85-1.99 Single Polarized	7/8" EIA 50 ohm	GPL6-18	6 (1.8)	B	28.5	28.8	29.1	5.6	33	37	1.10 (26.4)
		GPL8-18	8 (2.4)	A	31.0	31.3	31.6	4.2	37	39	1.06 (30.7)
		GPL10-18	10 (3.0)	A	32.9	33.2	33.5	3.4	40	42	1.06 (30.7)
		GPL12-18	12 (3.7)	A	34.5	34.8	35.1	2.9	40	44	1.06 (30.7)
		GPL15-18	15 (4.6)	A	36.4	36.7	37.0	2.3	40	46	1.06 (30.7)
Grid Antennas, F-Series Unpressurized											
1.85-1.99 Single Polarized	"F" Flange Male	GP6F-18A	6 (1.8)	B	28.4	28.7	29.0	5.6	33	37	1.15 (23.1)
		GP8F-18A	8 (2.4)	A	30.9	31.2	31.5	4.2	37	39	1.15 (23.1)
		GP10F-18A	10 (3.0)	A	32.8	33.1	33.4	3.4	40	42	1.15 (23.1)
		GP12F-18	12 (3.7)	A	34.4	34.7	35.0	2.9	40	44	1.15 (23.1)
		GP15F-18	15 (4.6)	A	36.3	36.6	36.9	2.3	40	46	1.15 (23.1)

† One or both ports tuned for 1.7-1.9 GHz available on special order. ‡ Part 94.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Single polarized air-dielectric feeds are pressurizable to 10 lb/in^2 (70 kPa). Dual polarized feeds are pressurizable to 3 lb/in^2 (20 kPa). F Series unpressurized feeds are foam filled and eliminate the need for pressurization equipment.

To Order. Specify *Antenna Type Number.* Refer to page 93 for general ordering information.

GPL8-19A, 8 ft (2.4 m) Grid Antenna with Integral Vertical Tower Mount

1.9 – 2.3 GHz Antennas — Electrical Characteristics (See page 64 for 2.1-2.2 GHz)

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas, Air Dielectric – Planar Radome Included											
1.9-2.3* Single Polarized	7/8″ EIA 50 ohm	**HP6-19D**	6 (1.8)	B	28.6	29.5	30.4	5.5	25	46	1.10 (26.4)
		HP8-19D	8 (2.4)	A	31.1	32.0	32.9	4.1	30	50	1.06 (30.7)
		HP10-19D	10 (3.0)	A	33.0	33.9	34.8	3.3	30	53	1.06 (30.7)
		HP12-19E	12 (3.7)	A	34.6	35.5	36.4	2.8	30	57	1.06 (30.7)
		HP15-19D	15 (4.6)	A	36.5	37.4	38.3	2.2	30	59	1.06 (30.7)
1.9-2.3*† Dual Polarized	7/8″ EIA 50 ohm	**HPX8-19C**	8 (2.4)	A	31.1	32.0	32.9	4.1	28	48	1.08 (28.3)
		HPX10-19D	10 (3.0)	A	33.0	33.9	34.8	3.3	28	50	1.08 (28.3)
		HPX12-19D	12 (3.7)	A	34.6	35.5	36.4	2.8	30	55	1.08 (28.3)
		HPX15-19D	15 (4.6)	A	36.5	37.4	38.3	2.2	28	53	1.08 (28.3)
High Performance Antennas, F-Series Unpressurized – Planar Radome Included											
1.9-2.3* Single Polarized	"F" Flange Male	**HP6F-19C**	6 (1.8)	B	28.5	29.4	30.3	5.5	25	46	1.20 (20.8)
		HP8F-19C	8 (2.4)	A	31.0	31.9	32.8	4.1	30	50	1.15 (23.1)
		HP10F-19C	10 (3.0)	A	32.9	33.8	34.7	3.3	30	53	1.15 (23.1)
		HP12F-19C	12 (3.7)	A	34.5	35.4	36.3	2.8	30	57	1.15 (23.1)
1.9-2.3*† Dual Polarized	"F" Flange Male	**HPX8F-19**	8 (2.4)	A	31.1	32.0	32.9	4.1	28	48	1.20 (20.8)
		HPX10F-19	10 (3.0)	A	33.0	33.9	34.8	3.3	28	53	1.20 (20.8)
Focal Plane Antennas, Air Dielectric**											
1.9-2.3* Single Polarized	7/8″ EIA 50 ohm	**FP8-19D**	8 (2.4)	—	30.6	31.5	32.3	4.1	30	50	1.08 (28.3)
		FP10-19D	10 (3.0)	—	32.3	33.2	34.1	3.3	30	53	1.07 (29.4)
		FP12-19D	12 (3.7)	—	33.9	34.8	35.7	2.8	30	55	1.07 (29.4)
1.9-2.3* Dual Polarized	7/8″ EIA 50 ohm	**FPX8-19**	8 (2.4)	—	30.4	31.2	32.0	4.1	25	47	1.10 (26.4)
		FPX10-19	10 (3.0)	—	32.3	33.1	33.9	3.3	29	52	1.08 (28.3)
		FPX12-19	12 (3.7)	—	34.0	34.8	34.9	2.8	29	52	1.08 (28.3)

*Specify operating band.
†One or both ports tuned for 1.7-1.9 GHz available on special order.
‡Part 94. Also meet FCC Standards for Common Carrier Service (Part 21).

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1.9 – 2.3 GHz Antennas — Electrical Characteristics (See page 64 for 2.1-2.2 GHz)

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Focal Plane Antennas, F-Series Unpressurized† †											
1.9-2.3*	"F"	**FP8F-19D**	8 (2.4)	—	30.5	31.4	32.2	4.1	30	50	1.20 (20.8)
Single	Flange	**FP10F-19D**	10 (3.0)	—	32.2	33.1	34.0	3.3	30	53	1.15 (23.1)
Polarized	Male	**FP12F-19D**	12 (3.7)	—	33.8	34.7	35.6	2.8	30	55	1.15 (23.1)
Low VSWR Standard Antennas, Air Dielectric											
1.9-2.3*	7/8" EIA	**PL4-19C**	4 (1.2)	—	24.9	25.8	26.7	8.2	30	33	1.30 (17.7)
Single	50 ohm	**PL6-19C**	6 (1.8)	B	28.6	29.5	30.4	5.5	30	37	1.10 (26.4)
Polarized		**PL8-19C**	8 (2.4)	A	31.1	32.0	32.9	4.1	30	40	1.06 (30.7)
		PL10-19C	10 (3.0)	A	33.0	33.9	34.8	3.3	30	44	1.06 (30.7)
		PL12-19E	12 (3.7)	A	34.6	35.5	36.4	2.8	30	46	1.06 (30.7)
		PL15-19D	15 (4.6)	A	36.5	37.4	38.3	2.2	30	50	1.06 (30.7)
1.9-2.3*†	7/8" EIA	**PXL8-19C**	8 (2.4)	A	31.1	32.0	32.9	4.1	28	43	1.08 (28.3)
Dual	50 ohm	**PXL10-19C**	10 (3.0)	A	33.0	33.9	34.8	3.3	28	45	1.08 (28.3)
Polarized		**PXL12-19C**	12 (3.7)	A	34.6	35.5	36.4	2.8	28	48	1.08 (28.3)
		PXL15-19C	15 (4.6)	A	36.5	37.4	38.3	2.2	28	48	1.08 (28.3)
Standard Antennas, F-Series Unpressurized											
1.9-2.3*	"F"	**P6F-19C**	6 (1.8)	B	28.5	29.4	30.3	5.5	30	37	1.20 (20.8)
Single	Flange	**P8F-19C**	8 (2.4)	A	31.0	31.9	32.8	4.1	30	40	1.15 (23.1)
Polarized	Male	**P10F-19C**	10 (3.0)	A	32.9	33.8	34.7	3.3	30	44	1.15 (23.1)
		P12F-19C	12 (3.7)	A	34.5	35.4	36.3	2.8	30	46	1.15 (23.1)
1.9-2.3*	"F"	**PXL8F-19**	8 (2.4)	B	31.1	32.0	32.9	4.1	28	43	1.20 (20.8)
Dual	Flange	**PXL10F-19**	10 (3.0)	A	33.0	33.9	34.8	3.3	28	45	1.20 (20.8)
Polarized	Male										
Grid Antennas, Air Dielectric											
1.9-2.3*	7/8" EIA	**GPL6-19A**	6 (1.8)	B	28.6	29.5	30.3	5.6	31	36	1.10 (26.4)
Single	50 ohm	**GPL8-19A**	8 (2.4)	A	31.1	32.0	32.8	4.2	35	39	1.08 (28.3)**
Polarized		**GPL10-19A**	10 (3.0)	A	33.0	33.9	34.7	3.4	40	42	1.08 (28.3)**
		GPL12-19A	12 (3.7)	A	34.6	35.5	36.3	2.9	40	44	1.08 (28.3)**
		GPL15-19A	15 (4.6)	A	36.5	37.4	38.2	2.3	40	46	1.08 (28.3)**
Grid Antennas, F-Series Unpressurized											
1.9-2.3*	"F"	**GP6F-19A**	6 (1.8)	B	28.5	29.4	30.2	5.4	31	36	1.20 (20.8)
Single	Flange	**GP8F-19A**	8 (2.4)	A	31.0	31.9	32.7	4.0	35	39	1.20 (20.8)
Polarized	Male	**GP10F-19A**	10 (3.0)	A	32.9	33.8	34.6	3.3	40	42	1.20 (20.8)
		GP12F-19	12 (3.7)	A	34.5	35.4	36.2	2.8	40	44	1.20 (20.8)
		GP15F-19	15 (4.6)	A	36.4	37.3	38.1	2.2	40	46	1.20 (20.8)
GRIDPAK™ Antennas, Air Dielectric											
1.9-2.3*	7/8" EIA	**KP4-19**	4 (1.2)	—	25.6	26.5	27.3	7.7	29	32	1.20 (20.8)
Single	50 ohm	**KP6-19**	6 (2.0)	B	29.4	30.3	31.1	5.0	32	36	1.10 (26.4)
Polarized		**KP8-19**	8 (2.4)	A	31.1	31.9	32.7	4.6	32	39	1.08 (28.3)
		KP10-19	10 (3.0)	A	32.9	33.8	34.6	3.3	35	41	1.08 (28.3)
		KP13-19	13 (4.0)	A	35.4	36.3	37.1	2.8	30	40	1.08 (28.3)
GRIDPAK Antennas, F-Series Unpressurized											
1.9-2.3*	"F"	**KP4F-19**	4 (1.2)	—	25.5	26.4	27.2	7.7	29	32	1.30 (17.7)
Single	Flange	**KP6F-19**	6 (2.0)	B	29.3	30.2	31.0	5.0	32	36	1.20 (20.8)
Polarized	Male	**KP8F-19**	8 (2.4)	A	31.0	31.8	32.6	4.6	32	39	1.20 (20.8)
		KP10F-19	10 (3.0)	A	32.8	33.7	34.5	3.3	35	41	1.20 (20.8)
		KP13F-19	13 (4.0)	A	35.3	36.2	37.0	2.8	30	40	1.20 (20.8)

*Specify operating band.
**1.06 (30.7) available on request.
† One or both ports tuned for 1.7-1.9 GHz available on special order.
‡ Part 94. Also meet FCC Standards for Common Carrier Service (Part 21).
† † Focal plane antennas are manufactured at our factories in Great Britain and Australia. They are not manufactured or stocked in the United States or Canada.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Single polarized air-dielectric feeds are pressurizable to 10 lb/in² (70 kPa). Dual polarized feeds are pressurizable to 3 lb/in² (20 kPa). F Series unpressurized feeds are foam filled and eliminate the need for pressurization equipment.

To Order. Specify *Antenna Type Number.* Refer to page 93 for general ordering information.

2.1 – 2.2 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Ultra High Performance Antenna, Air Dielectric – TEGLAR Long Life Radome Included											
2.1-2.2	7/8" EIA	**UHP8-21**	8 (2.4)	A	31.9	32.1	32.3	4.2	32	61	1.08 (28.3)
Single	50 ohm	**UHP10-21**	10 (3.0)	A	33.7	33.9	34.0	3.6	33	64	1.08 (28.3)
Polarized		**UHP12-21**	12 (3.7)	A	35.4	35.6	35.8	2.9	32	65	1.08 (28.3)
Ultra High Performance Antenna, F-Series Unpressurized – TEGLAR Long Life Radome Included											
2.1-2.2	"F"	**UHP8F-21**	8 (2.4)	A	31.9	32.1	32.3	4.2	32	61	1.10 (26.4)
Single	Flange	**UHP10F-21**	10 (3.0)	A	33.7	33.9	34.0	3.6	33	64	1.10 (26.4)
Polarized	Male	**UHP12F-21**	12 (3.7)	A	35.4	35.6	35.8	2.9	32	65	1.10 (26.4)
High Performance Antennas, Air Dielectric – TEGLAR Long Life Radome Included											
2.1-2.2	7/8" EIA	**HP8-21**	8 (2.4)	A	32.0	32.2	32.4	4.1	30	53	1.06 (30.7)
Single	50 ohm	**HP10-21**	10 (3.0)	A	33.9	34.1	34.3	3.4	32	55	1.06 (30.7)
Polarized		**HP12-21**	12 (3.7)	A	35.5	35.7	35.9	2.9	32	56	1.06 (30.7)
High Performance Antennas, F-Series Unpressurized – TEGLAR Long Life Radome Included											
2.1-2.2	"F"	**HP8F-21**	8 (2.4)	A	31.9	32.1	32.3	4.1	30	53	1.12 (24.9)
Single	Flange	**HP10F-21**	10 (3.0)	A	33.8	34.0	34.2	3.4	32	55	1.12 (24.9)
Polarized	Male	**HP12F-21**	12 (3.7)	A	35.4	35.6	35.8	2.9	32	56	1.12 (24.9)
Low VSWR Standard Antennas, Air Dielectric											
2.1-2.2	7/8" EIA	**PL6-21C**	6 (1.8)	A	29.8	30.0	30.2	4.9	30	39	1.10 (26.4)
Single	50 ohm	**PL8-21**	8 (2.4)	A	32.4	32.6	32.8	4.1	30	40	1.06 (30.7)
Polarized		**PL10-21**	10 (3.0)	A	34.1	34.3	34.5	3.3	30	44	1.06 (30.7)
		PL12-21	12 (3.7)	A	35.5	35.7	35.9	2.8	30	46	1.06 (30.7)
Standard Antennas, F-Series Unpressurized											
2.1-2.2	"F"	**P4F-21C**	4 (1.2)	B	26.4	26.6	26.8	7.6	30	36	1.15 (23.1)
Single	Flange	**P6F-21C**	6 (1.8)	A	29.8	30.0	30.2	4.9	30	39	1.12 (24.9)
Polarized	Male	**P8F-21C**	8 (2.4)	A	32.3	32.5	32.7	3.8	30	40	1.12 (24.9)
		P10F-21C	10 (3.0)	A	34.0	34.2	34.4	3.4	30	44	1.12 (24.9)
Grid Antennas, Air Dielectric											
2.1-2.2	7/8" EIA	**GPL6-21**	6 (1.8)	B	29.5	29.7	29.9	5.4	31	36	1.10 (26.4)
Single	50 ohm	**GPL8-21**	8 (2.4)	A	32.0	32.2	32.4	4.0	35	39	1.06 (30.7)
Polarized		**GPL10-21**	10 (3.0)	A	33.9	34.1	34.3	3.2	40	42	1.06 (30.7)
		GPL12-21	12 (3.7)	A	35.5	35.7	35.9	2.8	40	44	1.06 (30.7)
		GPL15-21	15 (4.6)	A	37.4	37.6	37.8	2.2	40	46	1.06 (30.7)
Grid Antennas, F-Series Unpressurized											
2.1-2.2	"F"	**GP6F-21A**	6 (1.8)	B	29.6	29.8	30.0	5.4	31	36	1.15 (23.1)
Single	Flange	**GP8F-21A**	8 (2.4)	A	32.0	32.2	32.4	4.0	35	39	1.15 (23.1)
Polarized	Male	**GP10F-21A**	10 (3.0)	A	34.0	34.2	34.4	3.3	40	42	1.15 (23.1)
		GP12F-21	12 (3.7)	A	35.5	35.7	35.9	2.8	40	44	1.15 (23.1)
		GP15F-21	15 (4.6)	A	37.4	37.6	37.8	2.2	40	46	1.15 (23.1)

‡ Part 94. Also meet FCC Standards for Common Carrier Service (Part 21).

2.3 – 2.5 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Focal Plane Antennas, Air Dielectric**										
2.3-2.5* Single Polarized	7/8" EIA 50 ohm	**FP4-23D**	4 (1.2)	26.2	26.5	26.9	7.7	30	40	1.20 (20.8)
		FP6-23D	6 (1.8)	29.8	30.4	30.6	5.3	28	41	1.15 (23.1)
		FP8-23D	8 (2.4)	32.6	32.7	33.0	4.1	30	52	1.10 (26.4)
		FP10-23D	10 (3.0)	34.7	34.8	35.3	3.4	30	53	1.08 (28.3)
		FP12-23D	12 (3.7)	35.8	36.4	36.6	2.8	30	57	1.08 (28.3)
2.3-2.5* Dual Polarized	7/8" EIA 50 ohm	**FPX6-23C**	6 (1.8)	28.9	29.2	29.6	5.5	27	41	1.15 (23.1)
		FPX8-23C	8 (2.4)	31.5	31.8	32.3	4.1	28	52	1.10 (26.4)
		FPX10-23C	10 (3.0)	33.8	33.9	34.2	3.3	29	54	1.08 (28.3)
		FPX12-23C	12 (3.7)	35.5	35.6	35.9	2.7	30	56	1.08 (28.3)
Focal Plane Antennas, F-Series Unpressurized**										
2.3-2.5* Single Polarized	"F" Flange Male	**FP4F-23D**	4 (1.2)	26.1	26.4	26.8	7.7	30	40	1.30 (17.7)
		FP6F-23D	6 (1.8)	29.7	30.3	30.5	5.3	28	41	1.25 (19.0)
		FP8F-23D	8 (2.4)	32.5	32.6	32.9	4.1	30	52	1.20 (20.8)
		FP10F-23D	10 (3.0)	34.6	34.7	35.2	3.4	30	53	1.15 (23.1)
		FP12F-23D	12 (3.7)	35.7	36.3	36.5	2.8	30	57	1.15 (23.1)
Low VSWR Standard Antennas, Air Dielectric										
2.3-2.5* Single Polarized	7/8" EIA 50 ohm	**PL6-23D**	6 (1.8)	30.5	30.8	31.2	4.8	28	36	1.10 (26.4)
		PL8-23D	8 (2.4)	33.0	33.4	33.7	3.5	30	39	1.08 (28.3)
		PL10-23D	10 (3.0)	34.9	35.3	35.7	2.8	30	42	1.08 (28.3)
		PL12-23D	12 (3.7)	36.5	37.0	37.2	2.5	30	44	1.08 (28.3)
Standard Antennas, F-Series Unpressurized										
2.3-2.5* Single Polarized	"F" Flange Male	**P4F-23E**	4 (1.2)	26.8	27.2	27.5	7.5	28	33	1.20 (20.8)
		P6F-23E	6 (1.8)	30.4	30.7	31.1	4.8	28	36	1.20 (20.8)
		P8F-23E	8 (2.4)	32.9	33.3	33.6	3.5	30	39	1.15 (23.1)
		P10F-23E	10 (3.0)	34.8	35.2	35.6	2.8	30	42	1.15 (23.1)
		P12F-23E	12 (3.7)	36.4	36.9	37.1	2.5	30	44	1.15 (23.1)
GRIDPAK™ Antennas, Air Dielectric										
2.3-2.5* Single Polarized	7/8" EIA 50 ohm	**KP4-23**	4 (1.2)	27.3	27.6	27.9	6.9	30	30	1.20 (20.8)
		KP6-23	6 (1.8)	31.1	31.4	31.7	4.5	30	36	1.10 (26.4)
		KP8-23	8 (2.4)	32.7	33.0	33.2	3.4	30	35	1.08 (28.3)
		KP10-23	10 (3.0)	34.6	34.9	35.2	3.0	30	38	1.08 (28.3)
		KP13-23	13 (4.0)	37.1	37.3	37.6	2.4	30	38	1.08 (28.3)
GRIDPAK Antennas, F-Series Unpressurized										
2.3-2.5* Single Polarized	"F" Flange Male	**KP4F-23**	4 (1.2)	27.2	27.5	27.8	6.9	30	30	1.30 (17.7)
		KP6F-23	6 (1.8)	31.0	31.3	31.6	4.5	30	36	1.20 (20.8)
		KP8F-23	8 (2.4)	32.6	32.9	33.1	3.4	30	35	1.15 (23.1)
		KP10F-23	10 (3.0)	34.5	34.8	35.1	3.0	30	38	1.15 (23.1)
		KP13F-23	13 (4.0)	37.0	37.2	37.5	2.4	30	38	1.15 (23.1)

*2.3-2.7 GHz antennas available on special order with increased VSWR. Specifications available on request.

**Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

2.45 – 2.5 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Standard Antennas, F-Series Unpressurized											
2.45-2.5 Single Polarized	"F" Flange Male	**P6F-24C**	6 (1.8)	B	30.9	31.0	31.1	4.3	28	36	1.30 (17.7)
		P8F-24C	8 (2.4)	A	33.4	33.5	33.6	3.2	28	39	1.30 (17.7)

‡ Part 94.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization

Antenna Series	Pressure Rating, Max.
-25 Single Polarized	10 lb/in^2 (70 kPa)
-25 Dual Polarized	3 lb/in^2 (20 kPa)
-34, -35, -37	5 lb/in^2 (35 kPa)

Termination Load for unused port of dual polarized antennas. Flange mates with CPR229G and PDR40 .... Type **39099-229**

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

2.48 – 2.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas, Air Dielectric – Planar Radome Included											
2.48-2.7	7/8″ EIA	**HP6-25D**	6 (1.8)	*	31.2	31.5	31.8	4.6	28	50	1.10 (26.4)
Single	50 ohm	**HP8-25D**	8 (2.4)	*	33.7	34.0	34.3	3.1	30	52	1.08 (28.3)
Polarized		**HP10-25D**	10 (3.0)	*	35.7	36.0	36.3	2.7	30	55	1.08 (28.3)
		HP12-25D	12 (3.7)	*	37.2	37.5	37.8	2.3	30	54	1.08 (28.3)
Focal Plane Antennas, Air Dielectric‡											
2.48-2.7†	7/8″ EIA	**FP4-25D**	4 (1.2)	—	26.9	27.2	27.6	7.2	30	41	1.20 (20.8)
Single	50 ohm	**FP6-25D**	6 (1.8)	—	30.6	30.7	31.1	4.9	28	44	1.15 (23.1)
Polarized		**FP8-25D**	8 (2.4)	—	33.0	33.5	33.6	3.9	30	52	1.10 (26.4)
		FP10-25D	10 (3.0)	—	35.3	35.6	35.9	3.2	30	55	1.08 (28.3)
		FP12-25D	12 (3.7)	—	36.6	37.0	37.4	2.6	30	57	1.08 (28.3)
2.48-2.7†	7/8″ EIA	**FPX6-25C**	6 (1.8)	—	29.6	30.0	30.3	5.0	27	42	1.15 (23.1)
Dual	50 ohm	**FPX8-25C**	8 (2.4)	—	32.3	32.6	32.7	3.9	27	52	1.10 (26.4)
Polarized		**FPX10-25C**	10 (3.0)	—	34.2	34.6	34.9	3.1	30	54	1.08 (28.3)
		FPX12-25C	12 (3.7)	—	35.9	36.3	36.8	2.6	30	56	1.08 (28.3)
Focal Plane Antennas, F-Series Unpressurized‡											
2.48-2.7†	"F"	**FP4F-25D**	4 (1.2)	—	26.8	27.1	27.5	7.2	30	41	1.30 (17.7)
Single	Flange	**FP6F-25D**	6 (1.8)	—	30.5	30.6	31.0	4.9	28	44	1.25 (19.0)
Polarized	Male	**FP8F-25D**	8 (2.4)	—	32.9	33.4	33.5	3.9	30	52	1.20 (20.8)
		FP10F-25D	10 (3.0)	—	35.2	35.5	35.8	3.2	30	55	1.15 (23.1)
		FP12F-25D	12 (3.7)	—	36.5	36.9	37.3	2.6	30	57	1.15 (23.1)
Standard Antennas, Air Dielectric											
2.48-2.7	7/8″ EIA	**PL6-25D**	6 (1.8)	*	31.2	31.5	31.8	4.2	28	36	1.10 (26.4)
Single	50 ohm	**PL8-25D**	8 (2.4)	*	33.7	34.0	34.3	3.1	30	39	1.08 (28.3)
Polarized		**PL10-25D**	10 (3.0)	*	35.7	36.0	36.3	2.7	30	42	1.08 (28.3)
		PL12-25D	12 (3.7)	*	37.2	37.5	37.8	2.2	30	44	1.08 (28.3)
Standard Antennas, F-Series Unpressurized											
2.48-2.7	"F"	**P4F-25D**	4 (1.2)	*	27.6	27.9	28.2	6.3	30	32	1.20 (20.8)
Single	Flange	**P6F-25D**	6 (1.8)	*	31.1	31.4	31.7	4.2	28	36	1.20 (20.8)
Polarized	Male	**P8F-25D**	8 (2.4)	*	33.6	33.9	34.2	3.1	30	39	1.15 (23.1)
		P10F-25D	10 (3.0)	*	35.6	35.9	36.2	2.7	30	42	1.15 (23.1)
		P12F-25D	12 (3.7)	*	37.1	37.4	37.7	2.2	30	44	1.15 (23.1)
Grid Antennas, Air Dielectric											
2.48-2.7	7/8″ EIA	**GPL6-25A**	6 (1.8)	*	30.8	31.2	31.5	4.2	34	35	1.10 (26.4)
Single	50 ohm	**GPL8-25A**	8 (2.4)	*	33.3	33.7	34.0	3.1	37	37	1.08 (28.3)
Polarized		**GPL10-25A**	10 (3.0)	*	35.2	35.5	35.8	2.7	39	40	1.08 (28.3)

*Satisfy U.S. FCC requirements of Parts 94 and 74.
†2.3-2.7 GHz antennas available on special request.

‡Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

2.48 – 2.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Grid Antennas, F-Series Unpressurized											
2.48-2.7	"F"	GP6F-25A	6 (1.8)	*	30.7	31.1	31.4	4.2	34	35	1.20 (20.8)
Single	Flange	GP8F-25A	8 (2.4)	*	33.2	33.6	33.9	3.1	37	37	1.15 (23.1)
Polarized	Male	GP10F-25A	10 (3.0)	*	35.1	35.4	35.7	2.7	39	40	1.15 (23.1)
GRIDPAK™ Antennas, Air Dielectric											
2.48-2.7	7/8" EIA	KP4-25	4 (1.2)	*	27.9	28.3	28.7	6.1	30	31	1.20 (20.8)
Single	50 ohm	KP6-25	6 (2.0)	*	31.7	32.1	32.5	4.0	30	35	1.10 (26.4)
Polarized		KP8-25	8 (2.4)	*	33.2	33.7	33.9	3.2	30	37	1.08 (28.3)
		KP10-25	10 (3.0)	*	35.2	35.6	36.0	2.7	31	38	1.08 (28.3)
		KP13-25	13 (4.0)	*	37.6	37.9	38.1	2.3	30	38	1.08 (28.3)
GRIDPAK Antennas, F-Series Unpressurized											
2.48-2.7	"F"	KP4F-25	4 (1.2)	*	27.8	28.2	28.6	6.1	30	31	1.30 (17.7)
Single	Flange	KP6F-25	6 (2.0)	*	31.6	32.0	32.4	4.0	30	35	1.20 (20.8)
Polarized	Male	KP8F-25	8 (2.4)	*	33.1	33.6	33.8	3.2	30	37	1.15 (23.1)
		KP10F-25	10 (3.0)	*	35.1	35.5	35.9	2.7	31	38	1.15 (23.1)
		KP13F-25	13 (4.0)	*	37.5	37.8	38.0	2.3	30	38	1.15 (23.1)

*Satisfy U.S. FCC requirements of Parts 94 and 74.

3.4-3.9, 3.54-4.18, 3.6-4.2 and 3.7-4.2 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Standard‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® Ultra High Performance Antennas – Planar Radome Included											
3.4-3.9	CPR229G	UHX8-34C	8 (2.4)	—	36.2	36.9	37.6	2.4	30	62	1.06 (30.7)
Dual	and	UHX10-34C	10 (3.0)	—	38.1	38.8	39.5	1.8	30	62	1.06 (30.7)
Polarized	PDR40	UHX12-34C	12 (3.7)	—	39.6	40.4	41.1	1.5	32	65	1.06 (30.7)
		UHX15-34C	15 (4.6)	—	41.6	42.3	43.0	1.2	29	66	1.06 (30.7)
3.54-4.18**	CPR229G	UHX8-35D	8 (2.4)	—	36.1	36.8	37.5	2.4	30	65	1.06 (30.7)
Extended	and	UHX10-35C	10 (3.0)	—	38.1	38.8	39.5	1.8	32	65	1.06 (30.7)
Bandwidth	PDR40	UHX12-35D	12 (3.7)	—	39.6	40.4	41.1	1.5	32	68	1.06 (30.7)
Dual		UHX15-35C	15 (4.6)	—	41.6	42.3	43.0	1.2	30	68	1.06 (30.7)
Polarized											
UHX II® Ultra High Performance Antennas – TEGLAR® Long Life Radome Included											
3.7-4.2	CPR229G	UHX8-37H	8 (2.4)	A	36.8	37.4	37.6	2.4	33	66	1.06 (30.7)
Dual	and	UHX10-37H	10 (3.0)	A	38.5	39.1	39.5	1.8	33	67	1.06 (30.7)
Polarized	PDR40	UHX12-37H	12 (3.7)	A	40.4	41.0	41.2	1.5	33	72	1.06 (30.7)
		UHX15-37H	15 (4.6)	A	42.1	42.7	43.1	1.2	33	71	1.06 (30.7)
Focal Plane Antennas* **											
3.4-3.9	CPR229G	FP10-34	10 (3.0)	—	37.0	38.3	38.8	1.9	28	60	1.06 (30.7)
Single	and	FP12-34	12 (3.7)	—	39.3	39.8	40.3	1.6	29	62	1.06 (30.7)
Polarized	PDR40										
3.6-4.2	CPR229G	FP10-36	10 (3.0)	—	38.6	39.1	39.6	1.7	29	62	1.06 (30.7)
Single	and	FP12-36	12 (3.7)	—	40.3	40.9	41.2	1.4	31	64	1.06 (30.7)
Polarized	PDR40										
3.6-4.2	CPR229G	FPX10-36	10 (3.0)	—	38.6	39.1	39.6	1.7	26	62	1.06 (30.7)
Dual	and	FPX12-36	12 (3.7)	—	40.3	40.9	41.2	1.4	27	64	1.06 (30.7)
Polarized	PDR40										
Low VSWR Standard Antennas											
3.7-4.2	CPR229G	PL6-37E	6 (1.8)	†	34.5	35.0	35.5	3.0	30	40	1.07 (29.4)
Single	and	PL8-37D	8 (2.4)	†	36.7	37.3	37.8	2.4	30	42	1.05 (32.3)
Polarized	PDR40	PL10-37D	10 (3.0)	B	38.7	39.3	39.8	1.8	30	47	1.05 (32.3)
		PL12-37F	12 (3.7)	B	40.4	41.0	41.5	1.5	30	50	1.05 (32.3)
		PL15-37D	15 (4.6)	B	42.1	42.7	43.2	1.2	30	52	1.05 (32.3)
3.7-4.2	CPR229G	PXL10-37D	10 (3.0)	B	38.7	39.3	39.8	1.8	30	45	1.06 (30.7)
Dual	and	PXL12-37E	12 (3.7)	B	40.4	41.0	41.1	1.5	30	48	1.06 (30.7)
Polarized	PDR40	PXL15-37D	15 (4.6)	B	42.1	42.7	43.0	1.2	30	52	1.06 (30.7)

**Meets Canadian DOC requirements.
† Does not meet U.S. FCC Standards A or B.
‡ Part 21.

***Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

USAFCS Standards. 4.4-5.0 GHz antennas meeting United States Air Force Communications Service Standards are available on special order.

OIRT Specifications. Antennas for use in the 5.6-6.1 GHz band are available on special order.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Feeds are pressurizable to 10 lb/in^2 (70 kPa).

Termination Load for unused port of dual polarized antennas. Flange mates with:

CPR137G and PDR70 .... Type **39099-137**
UG-148C/U, CAR48, PAR48 .... Type **39098-187**

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

UHX10-59J, 10 ft (3 m) UHXII® Ultra High Performance Antenna with T10SB Vertical Tower Mount

4.4 – 5.0 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas – Planar Radome Included										
4.4-5.0 Single Polarized	UG-149/U UAR48 and PAR48	**HP6-44E**	6 (1.8)	36.0	36.6	37.1	2.5	30	62	1.05 (32.3)
		HP8-44E	8 (2.4)	38.7	39.3	39.8	1.8	30	65	1.05 (32.3)
		HP10-44E	10 (3.0)	40.4	41.0	41.5	1.5	30	67	1.05 (32.3)
		HP12-44F	12 (3.7)	42.1	42.7	43.2	1.2	30	67	1.05 (32.3)
		HP15-44E	15 (4.6)	44.0	44.5	45.0	1.0	30	68	1.05 (32.3)
Low VSWR Standard Antennas										
4.4-5.0 Single Polarized	UG-149/U UAR48 and PAR48	**PL4-44E**	4 (1.2)	32.4	33.0	33.5	3.7	30	40	1.08 (28.3)
		PL6-44E	6 (1.8)	36.0	36.6	37.1	2.5	30	44	1.05 (32.3)
		PL8-44E	8 (2.4)	38.7	39.3	39.8	1.8	30	45	1.05 (32.3)
		PL10-44E	10 (3.0)	40.4	41.0	41.5	1.5	30	49	1.05 (32.3)
		PL12-44G	12 (3.7)	42.1	42.7	43.2	1.2	30	50	1.05 (32.3)
		PL15-44F	15 (4.6)	44.0	44.5	45.0	1.0	29	51	1.05 (32.3)
4.4-5.0 Dual Polarized	UG-149/U UAR48 and PAR48	**HPX6-44D**	6 (1.8)	35.8	36.3	36.8	2.5	30	60	1.06 (30.7)
		HPX8-44D	8 (2.4)	38.6	39.1	39.7	1.8	30	64	1.06 (30.7)
		HPX10-44D	10 (3.0)	39.8	40.3	40.9	1.5	30	66	1.06 (30.7)
		HPX12-44D	12 (3.7)	41.9	42.5	43.0	1.2	30	67	1.06 (30.7)
4.4-5.0 Dual Polarized	UG-149/U UAR48 and PAR48	**PXL4-44**	4 (1.2)	32.3	32.9	33.4	3.7	30	40	1.08 (28.3)
		PXL6-44	6 (1.8)	35.9	36.4	36.9	2.5	30	46	1.05 (32.3)
		PXL8-44	8 (2.4)	38.6	39.2	39.7	1.8	30	49	1.05 (32.3)
		PXL10-44	10 (3.0)	40.3	40.9	41.4	1.5	30	50	1.05 (32.3)
		PXL12-44	12 (3.7)	42.0	42.6	43.1	1.2	30	51	1.05 (32.3)

5.6-6.2, 5.85-6.425, 5.925-6.425 and 5.925-7.125 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Standard‡	Gain, dBi Bottom	Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® Ultra High Performance Antennas – Planar Radome Included											
5.6-6.2 Dual Polarized	CPR137G and PDR70‡‡	UHX10-56C	10 (3.0)	—	42.5	42.9	43.3	1.1	36	72	1.06 (30.7)
		UHX12-56C	12 (3.7)	—	44.0	44.5	44.9	0.9	36	73	1.06 (30.7)
UHXII® Ultra High Performance Antennas – TEGLAR® Long Life Radome Included											
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	UHX6-59H	6 (1.8)	A	38.4	38.8	39.1	1.8	33	75	1.06 (30.7)
		UHX8-59H	8 (2.4)	A	40.9	41.3	41.6	1.4	33	77	1.06 (30.7)*
		UHX10-59H	10 (3.0)	A	42.9	43.2	43.6	1.1	33	77	1.06 (30.7)*
		UHX12-59H	12 (3.7)	A	44.4	44.8	45.2	0.9	34	79	1.06 (30.7)*
		UHX15-59H	15 (4.6)	A	46.1	46.4	46.8	0.8	34	80	1.06 (30.7)*
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	UHX10-59J	10 (3.0)	A	42.9	43.2	43.6	1.1	34	80	1.06 (30.7)*
		UHX12-59J	12 (3.7)	A	44.4	44.8	45.2	0.9	35	80	1.06 (30.7)*
5.925-7.110 Dual Polarized	CPR137G and PDR70‡‡	UHX10A-59	10 (3.0)	A	43.0	44.0	44.9	1.2	28	68	†
UHX® Ultra High Performance/High XPD Antennas – TEGLAR Long Life Radome Included											
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	UHX10X-59C	10 (3.0)	A	42.9	43.1	43.3	1.3	38	75	1.06 (30.7)
		UHX12X-59C	12 (3.7)	A	44.4	44.8	45.1	1.3	38	78	1.06 (30.7)
UHX® Ultra Gain Antennas – Planar Radome Included											
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	UGX10R-59C	10 (3.0)	A	44.0	44.3	44.5	1.0	35	75	1.06 (30.7)
		UGX12R-59D	12 (3.7)	A	45.5	45.8	46.0	0.8	31	75	1.06 (30.7)
High XPD Antenna – TEGLAR Long Life Radome Included											
5.8-6.425 Dual Polarized	CPR137G and PDR70‡‡	HXPD12-58	12 (3.7)	—	44.1	44.4	44.7	1.07	36	71	1.08 (28.3)
Focal Plane Antennas**											
5.925-6.425 Single Polarized	CPR137G and PDR70‡‡	FP8-59	8 (2.4)	—	40.3	40.6	40.8	1.4	28	64	1.06 (30.7)
		FP10-59	10 (3.0)	—	42.5	42.8	42.9	1.1	28	66	1.04 (34.2)
		FP12-59	12 (3.7)	—	44.2	44.6	44.7	0.9	28	68	1.04 (34.2)
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	FPX8-59	8 (2.4)	—	40.1	40.4	40.6	1.4	27	64	1.07 (29.4)
		FPX10-59	10 (3.0)	—	42.3	42.6	42.7	1.1	28	66	1.06 (30.7)
		FPX12-59	12 (3.7)	—	44.0	44.4	44.5	0.9	28	68	1.06 (30.7)
Low VSWR Standard Antennas											
5.925-6.425 Single Polarized	CPR137G and PDR70‡‡	PL6-59D	6 (1.8)	B	38.4	38.9	39.4	1.8	30	46	1.06 (30.7)
		PL8-59D	8 (2.4)	B	41.1	41.5	41.9	1.4	30	48	1.04 (34.2)
		PL10-59D	10 (3.0)	B	42.9	43.3	43.6	1.1	30	51	1.04 (34.2)
		PL12-59E	12 (3.7)	B	44.7	45.0	45.2	0.9	30	52	1.04 (34.2)
		PL15-59D	15 (4.6)	B	46.1	46.4	46.8	0.8	30	53	1.04 (34.2)
5.925-6.425 Dual Polarized	CPR137G and PDR70‡‡	PXL6-59E	6 (1.8)	B	38.4	38.7	39.1	1.8	30	46	1.07 (29.4)
		PXL8-59D	8 (2.4)	B	40.9	41.3	41.6	1.4	30	48	1.06 (30.7)
		PXL10-59D	10 (3.0)	B	42.7	43.1	43.5	1.1	30	49	1.06 (30.7)
		PXL12-59F	12 (3.7)	B	44.4	44.8	45.2	0.9	30	53	1.06 (30.7)
		PXL15-59E	15 (4.6)	B	46.1	46.4	46.8	0.8	30	54	1.06 (30.7)

*VSWR of 1.04 (34.2) is available on special order.
†1.06 (30.7) from 5.925-6.425 GHz and 1.10 (26.4) from 6.425-7.110 GHz.
‡Part 21.
‡‡For PAR70 specify when ordering.

**Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

U.K. Home Office Requirements. -71 Series antennas that meet U.K. Home Office Requirements are available in the 7.425-7.900 GHz band.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Feeds are pressurizable to 10 lb/in^2 (70 kPa).

Termination Load for unused port of dual polarized antenna. Flange mates with:
CPR137G and PDR70 .... Type **39099-137**
CPR112G and PDR84 .... Type **39099-112**

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

6.425 – 7.125 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® Ultra High Performance Antennas – Planar Radome Included											
6.425-7.125	CPR137G	**UHX6-65D**	6 (1.8)	B	39.1	39.5	40.0	1.7	30	70	1.06 (30.7)
Dual	and	**UHX8-65D**	8 (2.4)	A	41.6	42.0	42.4	1.3	35	70	1.06 (30.7)*
Polarized	PDR70	**UHX10-65D**	10 (3.0)	A	43.6	44.0	44.4	1.0	32	75	1.06 (30.7)*
**		**UHX12-65J††**	12 (3.7)	A	45.2	45.7	46.1	0.9	36	75	1.06 (30.7)*
		UHX15-65E	15 (4.6)	A	46.6	46.9	47.3	0.7	30	75	1.06 (30.7)*
High Performance Antennas – Planar Radome Included											
6.425-7.125	CPR137G	**HP6-65E**	6 (1.8)	B	39.4	39.8	40.2	1.7	30	64	1.06 (30.7)
Single	and	**HP8-65E**	8 (2.4)	A	41.9	42.3	42.8	1.3	30	66	1.04 (34.2)
Polarized	PDR70	**HP10-65E**	10 (3.0)	A	43.6	43.9	44.3	1.0	27	70	1.04 (34.2)
		HP12-65E	12 (3.7)	A	45.2	45.6	46.1	0.8	30	71	1.04 (34.2)
		HP15-65D	15 (4.6)	A	46.8	47.1	47.6	0.7	30	71	1.04 (34.2)
Focal Plane Antennas***											
6.425-7.125	CPR137G	**FP6-64**	6 (1.8)	—	38.2	38.6	38.8	1.8	28	57	1.07 (29.4)
Single	and	**FP8-64**	8 (2.4)	—	41.1	41.5	41.8	1.3	30	64	1.06 (30.7)
Polarized	PDR70	**FP10-64**	10 (3.0)	—	43.2	43.3	43.8	1.0	27	66	1.04 (34.2)
		FP12-64	12 (3.7)	—	44.9	45.3	45.5	0.8	30	68	1.04 (34.2)
6.425-7.125	CPR137G	**FPX6-64**	6 (1.8)	—	38.0	38.4	38.6	1.8	28	57	1.08 (28.3)
Dual	and	**FPX8-64**	8 (2.4)	—	40.8	41.2	41.4	1.3	30	64	1.07 (29.4)
Polarized	PDR70	**FPX10-64**	10 (3.0)	—	43.0	43.4	43.6	1.0	30	66	1.06 (30.7)
		FPX12-64	12 (3.7)	—	44.8	45.2	45.4	0.8	30	68	1.06 (30.7)
Low VSWR Standard Antennas											
6.425-7.125	CPR137G	**PL6-65D**	6 (1.8)	B	39.3	39.8	40.2	1.7	30	47	1.06 (30.7)
Single	and	**PL8-65D**	8 (2.4)	A	41.9	42.3	42.8	1.3	30	49	1.04 (34.2)
Polarized	PDR70	**PL10-65D**	10 (3.0)	A	43.6	43.9	44.3	1.0	30	52	1.04 (34.2)
		PL12-65E	12 (3.7)	A	45.2	45.6	46.1	0.8	30	53	1.04 (34.2)
		PL15-65D	15 (4.6)	A	46.8	47.1	47.6	0.7	30	54	1.04 (34.2)
6.425-7.125	CPR137G	**PXL6-65D**	6 (1.8)	B	39.1	39.4	39.9	1.7	30	47	1.07 (29.4)
Dual	and	**PXL8-65D**	8 (2.4)	A	41.6	42.0	42.4	1.3	34	52	1.06 (30.7)
Polarized	PDR70	**PXL10-65D**	10 (3.0)	A	43.6	44.0	44.4	1.0	34	58	1.06 (30.7)
		PXL12-65E	12 (3.7)	A	45.0	45.4	45.9	0.8	30	62	1.06 (30.7)
		PXL15-65E	15 (4.6)	A	46.6	46.9	47.3	0.7	30	54	1.06 (30.7)
Standard Antennas											
6.425-7.125	UG-344/U	**P4-65D**	4 (1.2)	†	35.8	36.3	36.7	2.5	30	43	1.10 (26.4)
Single	UAR70	**P6-65D**	6 (1.8)	B	39.3	39.8	40.2	1.7	30	47	1.10 (26.4)
Polarized	and	**P8-65D**	8 (2.4)	A	41.9	42.3	42.8	1.3	30	49	1.10 (26.4)
	PAR70	**P10-65D**	10 (3.0)	A	43.6	43.9	44.3	1.0	30	52	1.10 (26.4)
		P12-65E	12 (3.7)	A	45.2	45.6	46.1	0.8	30	53	1.10 (26.4)
		P15-65D	15 (4.6)	A	46.8	47.1	47.6	0.7	30	54	1.10 (26.4)

*VSWR of 1.06 (34.2) from 6.425 to 6.930 GHz is available on special order.
**Meets Canadian DOC standards.
† Does not meet Categories A or B.
†† UHXII® Ultra High Performance Antenna includes TEGLAR® long life radome.
‡ Part 94.

***Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

7.125-7.750 and 7.125-8.4 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas – Planar Radome Included										
7.125-7.750* Single Polarized	CPR137G and PDR70	**HP6-71D**	6 (1.8)	40.1	40.5	40.9	1.5	28	65	1.06 (30.7)
		HP8-71D	8 (2.4)	42.6	43.0	43.3	1.1	30	67	1.04 (34.2)
		HP10-71D	10 (3.0)	44.3	44.7	45.0	0.9	30	70	1.04 (34.2)
		HP12-71E	12 (3.7)	46.3	46.7	47.1	0.7	30	71	1.04 (34.2)
		HP15-71D	15 (4.6)	47.4	48.1	48.4	0.6	30	71	1.04 (34.2)
7.125-7.750* Single Polarized	CPR112G and PDR84	**HP6-71GE**	6 (1.8)	39.7	40.0	40.3	1.5	30	66	1.06 (30.7)
		HP8-71GE	8 (2.4)	42.3	42.5	42.9	1.1	30	68	1.04 (34.2)
		HP10-71GE	10 (3.0)	44.1	44.5	44.8	0.9	28	70	1.04 (34.2)
		HP12-71GF	12 (3.7)	45.6	46.0	46.3	0.7	30	71	1.04 (34.2)
		HP15-71GE	15 (4.6)	47.5	47.8	48.2	0.6	30	71	1.04 (34.2)
7.125-7.750* Dual Polarized	CPR137G and PDR70	**HPX6-71E**	6 (1.8)	40.0	40.4	40.7	1.5	25	65	1.07 (29.4)
		HPX8-71E	8 (2.4)	42.4	42.9	43.2	1.1	30	67	1.06 (30.7)
		HPX10-71E	10 (3.0)	44.5	44.8	45.0	0.9	30	70	1.06 (30.7)
		HPX12-71E	12 (3.7)	45.7	46.1	46.4	0.8	28	71	1.06 (30.7)
		HPX15-71D	15 (4.6)	47.3	47.7	48.0	0.7	32	72	1.06 (30.7)
Focal Plane Antennas**										
7.125-7.725 Single Polarized	CPR137G and PDR70	**FP4-71**	4 (1.2)	34.9	35.2	35.4	2.2	25	52	1.10 (26.4)
		FP6-71	6 (1.8)	38.8	39.2	39.5	1.5	25	58	1.07 (29.4)
		FP8-71	8 (2.4)	42.0	42.3	42.4	1.1	26	65	1.06 (30.7)
		FP10-71	10 (3.0)	44.1	44.4	44.5	0.9	26	67	1.04 (34.2)
		FP12-71	12 (3.7)	45.7	46.1	46.2	0.7	28	69	1.04 (34.2)
7.125-7.725 Dual Polarized	CPR137G and PDR70	**FPX6-71**	6 (1.8)	38.8	39.2	39.5	1.5	25	58	1.08 (28.3)
		FPX8-71	8 (2.4)	41.8	42.1	42.3	1.1	26	65	1.07 (29.4)
		FPX10-71	10 (3.0)	43.9	44.2	44.3	0.9	26	67	1.06 (30.7)
		FPX12-71	12 (3.7)	45.5	45.9	46.0	0.7	28	69	1.06 (30.7)
Low VSWR Standard Antennas										
7.125-7.750* Single Polarized	CPR137G and PDR70	**PL4-71D**	4 (1.2)	36.7	37.0	37.3	2.2	30	46	1.08 (28.3)
		PL6-71D	6 (1.8)	40.1	40.5	40.9	1.5	30	48	1.06 (30.7)
		PL8-71D	8 (2.4)	42.6	43.0	43.3	1.1	30	50	1.04 (34.2)
		PL10-71E	10 (3.0)	44.3	44.7	45.0	0.9	25	52	1.04 (34.2)
		PL12-71F	12 (3.7)	46.3	46.7	47.1	0.7	23	54	1.04 (34.2)
		PL15-71E	15 (4.6)	47.7	48.1	48.4	0.6	30	55	1.04 (34.2)
7.125-7.750* Single Polarized	CPR112G and PDR84	**PL4-71GD**	4 (1.2)	36.2	36.5	36.8	2.2	30	45	1.06 (30.7)
		PL6-71GD	6 (1.8)	39.7	40.0	40.3	1.5	30	48	1.06 (30.7)
		PL8-71GE	8 (2.4)	42.3	42.5	42.9	1.1	30	50	1.04 (34.2)
		PL10-71GE	10 (3.0)	44.1	44.5	44.8	0.9	30	52	1.04 (34.2)
		PL12-71GF	12 (3.7)	45.6	46.0	46.3	0.7	30	54	1.04 (34.2)
		PL15-71GD	15 (4.6)	47.5	47.8	48.2	0.6	30	57	1.04 (34.2)
7.125-7.750* Dual Polarized	CPR137G and PDR70	**PXL6-71E**	6 (1.8)	40.0	40.4	40.7	1.5	30	48	1.07 (29.4)
		PXL8-71E	8 (2.4)	42.4	42.9	43.2	1.1	30	50	1.06 (30.7)
		PXL10-71E	10 (3.0)	44.5	44.8	45.0	0.9	30	52	1.06 (30.7)
		PXL12-71E	12 (3.7)	45.7	46.1	46.4	0.7	30	54	1.06 (30.7)
Standard Antennas										
7.125-7.750* Single Polarized	CPR137G and PDR70	**P4-71D**	4 (1.2)	36.7	37.0	37.3	2.2	30	46	1.10 (26.4)
		P6-71D	6 (1.8)	40.1	40.5	40.9	1.5	30	48	1.10 (26.4)
		P8-71D	8 (2.4)	42.6	43.0	43.3	1.1	30	50	1.10 (26.4)
		P10-71E	10 (3.0)	44.3	44.7	45.0	0.9	25	52	1.10 (26.4)
		P12-71F	12 (3.7)	46.3	46.7	47.1	0.7	23	54	1.10 (26.4)
		P15-71E	15 (4.6)	47.7	48.1	48.4	0.6	30	55	1.10 (26.4)
7.125-8.4 Single Polarized	CPR112G and PDR84	**P4-71GD**	4 (1.2)	36.2	36.8	37.5	2.2	30	45	1.10 (26.4)
		P6-71GD	6 (1.8)	39.7	40.3	41.1	1.5	30	48	1.10 (26.4)
		P8-71GE	8 (2.4)	42.3	42.9	43.6	1.1	30	50	1.10 (26.4)
		P10-71GE	10 (3.0)	44.0	44.8	45.5	0.9	30	52	1.10 (26.4)
		P12-71GF	12 (3.7)	45.6	46.3	47.1	0.7	30	54	1.10 (26.4)
		P15-71GD	15 (4.6)	47.5	48.2	48.9	0.6	30	57	1.10 (26.4)

*7.110-7.725 available on request.

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FP8-77G, 8 ft (2.4 m) Focal Plane Antennas with Vertical Tower Mount

PL8-77GE, 8 ft (2.4 m) Low VSWR Standard Antenna with Vertical Tower Mount

System Planning and Accessories Pages

USAFCS Standards. Antennas meeting United States Air Force Communications Service Standards are available on special order.

OIRT Specifications. Antennas tuned for the 7.9-8.2 GHz band are available on special order.

U.K. Home Office Requirements. -71 Series antennas that meet U.K. Home Office Requirements W-6434B are available in the 7.425-7.900 GHz band.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Feeds are pressurizable to 10 lb/in^2 (70 kPa).

Termination Load for unused port of dual polarized antennas. Flange mates with CPR112G, PDR84 .... Type **39099-112**

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

7.725-8.275 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® Ultra High Performance Antennas – Planar Radome Included										
7.725-8.275* Dual Polarized	CPR112G and PDR84	**UHX6-77GD**	6 (1.8)	40.5	41.0	41.2	1.5	30	67	1.06 (30.7)
		UHX8-77GD	8 (2.4)	43.1	43.5	43.7	1.1	30	68	1.06 (30.7)
		UHX15-77GD	15 (4.6)	48.4	48.7	48.9	0.6	30	70	1.06 (30.7)
High XPD Antennas – TEGLAR® Long Life Radome Included										
7.725-8.275* Dual Polarized	CPR112G and PDR84	**HXPD6-77GC**	6 (1.8)	40.5	40.7	41.0	1.5	35	70	1.06 (30.7)
		HXPD8-77GC	8 (2.4)	43.1	43.4	43.7	1.1	36	70	1.06 (30.7)
		HXPD10-77GC	10 (3.0)	44.9	45.2	45.6	0.9	37	75	1.06 (30.7)
		HXPD12-77GC	12 (3.7)	46.4	46.7	47.0	0.7	37	75	1.06 (30.7)

*Meets Canadian DOC Standard SRSP306. VSWR 1.06 (30.7), 7.725-8.5 GHz on request.

7.750-8.4, 7.725-8.5 and 8.2-8.5 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas – Planar Radome Included										
7.750-8.4* Single Polarized	CPR112G and PDR84	**HP6-77GE**	6 (1.8)	40.3	40.8	41.1	1.5	30	68	1.06 (30.7)
		HP8-77GE	8 (2.4)	42.9	43.3	43.6	1.1	30	68	1.04 (34.2)
		HP10-77GE	10 (3.0)	44.8	45.2	45.5	0.9	30	70	1.04 (34.2)
		HP12-77GF	12 (3.7)	46.3	46.7	47.1	0.7	30	71	1.04 (34.2)
		HP15-77GE	15 (4.6)	48.2	48.5	48.9	0.6	30	71	1.04 (34.2)
8.2-8.5 Single Polarized	CPR112G and PDR84	**HP6-82C**	6 (1.8)	40.6	40.8	41.0	1.5	30	68	1.04 (34.2)
		HP8-82C	8 (2.4)	43.4	43.5	43.7	1.1	30	68	1.04 (34.2)
		HP10-82C	10 (3.0)	45.3	45.5	45.7	0.9	30	70	1.04 (34.2)
		HP12-82C	12 (3.7)	46.8	47.0	47.1	0.7	30	71	1.04 (34.2)
		HP15-82C	15 (4.6)	48.6	48.8	48.9	0.6	30	71	1.04 (34.2)
8.2-8.5 Dual Polarized	CPR112G and PDR84	**HPX6-82C**	6 (1.8)	41.0	41.1	41.2	1.3	30	58	1.06 (30.7)
		HPX8-82C	8 (2.4)	43.5	43.6	43.7	1.0	30	67	1.06 (30.7)
		HPX10-82C	10 (3.0)	45.5	45.6	45.7	0.8	30	70	1.06 (30.7)
		HPX12-82C	12 (3.7)	47.1	47.2	47.3	0.7	30	70	1.06 (30.7)
		HPX15-82C	15 (4.6)	48.7	48.8	48.9	0.6	30	70	1.06 (30.7)
Focal Plane Antennas**										
7.725-8.5 Single Polarized	CPR112G and PDR84	**FP6-77G**	6 (1.8)	40.2	40.6	40.8	1.5	30	60	1.07 (29.4)
		FP8-77G	8 (2.4)	42.9	43.3	43.5	1.1	26	64	1.06 (30.7)
		FP10-77G	10 (3.0)	44.9	45.3	45.4	0.9	30	66	1.04 (34.2)
		FP12-77G	12 (3.7)	46.5	46.9	47.0	0.7	28	68	1.04 (34.2)
7.725-8.5 Dual Polarized	CPR112G and PDR84	**FPX6-77G**	6 (1.8)	40.2	40.4	40.6	1.5	30	58	1.08 (28.3)
Low VSWR Standard Antennas										
7.750-8.4* Single Polarized	CPR112G and PDR84	**PL4-77GD**	4 (1.2)	36.8	37.2	37.5	2.2	30	45	1.06 (30.7)
		PL6-77GE	6 (1.8)	40.3	40.8	41.1	1.5	30	48	1.06 (30.7)
		PL8-77GE	8 (2.4)	42.9	43.3	43.6	1.1	30	50	1.04 (34.2)
		PL10-77GD	10 (3.0)	44.8	45.2	45.5	0.9	30	58	1.04 (34.2)
		PL12-77GF	12 (3.7)	46.3	46.7	47.1	0.7	30	54	1.04 (34.2)
		PL15-77GD	15 (4.6)	48.2	48.5	48.9	0.6	30	57	1.04 (34.2)
8.2-8.5 Single Polarized	CPR112G and PDR84	**PL6-82C**	6 (1.8)	40.6	40.8	41.0	1.5	30	48	1.06 (30.7)
		PL8-82C	8 (2.4)	43.4	43.5	43.7	1.1	30	50	1.04 (34.2)
		PL10-82C	10 (3.0)	45.3	45.5	45.7	0.9	30	58	1.04 (34.2)
		PL12-82C	12 (3.7)	46.8	47.0	47.1	0.7	30	54	1.04 (34.2)
		PL15-82C	15 (4.6)	48.6	48.8	48.9	0.6	30	57	1.04 (34.2)
8.2-8.5 Dual Polarized	CPR112G and PDR84	**PXL6-82C**	6 (1.8)	41.0	41.1	41.2	1.3	30	48	1.06 (30.7)
		PXL8-82C	8 (2.4)	43.7	43.8	43.9	1.0	30	55	1.06 (30.7)
		PXL10-82C	10 (3.0)	45.7	45.8	45.9	0.8	30	50	1.06 (30.7)
		PXL12-82C	12 (3.7)	47.3	47.4	47.5	0.7	30	63	1.06 (30.7)
		PXL15-82C	15 (4.6)	48.5	48.6	48.7	0.6	30	65	1.06 (30.7)

*7.725-8.275 or 7.725-8.5 GHz available on request.

**Focal plane antennas are manufactured and stocked at our factory in Great Britain and are manufactured on special order in Australia. They are not manufactured or stocked in the United States or Canada.

System Planning and Accessories

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Feeds, except LD Series, are pressurizable to 10 lb/in^2 (70 kPa). LD Series are pressurizable to 3 lb/in^2 (21 kPa).

Termination Load for unused port of dual polarized antenna. Flange mates with:
CPR90G and PDR100 .... Type **39099-90**
WR75 choke and cover .... Type **39098-75**

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

UHX10-107H 10 ft (3.0 m) UHXII® Ultra High Performance Antenna with Vertical Tower Mount and TEGLAR Long Life Radome

10.5 – 10.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Standard‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® Ultra High Performance Antennas – Planar Radome Included											
10.5-10.7 Dual Polarized	CPR90G and PDR100	**UHX4-105**	4 (1.2)	A	39.8	39.9	40.0	1.7	33	70	1.08 (28.3)
LD Series Antennas											
10.5-10.7 Single Polarized	CPR90G and PDR100	**LD2-105C**	2 (0.6)	B	34.0	34.1	34.2	3.5	25	39	1.30 (17.7)
		LD4-105C	4 (1.2)	B	39.5	39.6	39.7	1.7	25	45	1.30 (17.7)
		LD6-105C	6 (1.8)	B	43.0	43.1	43.2	1.1	25	50	1.30 (17.7)

10.7 – 11.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHXII® Ultra High Performance Antennas – TEGLAR® Long Life Radome Included											
10.7-11.7 Dual Polarized	CPR90G and PDR100	**UHX4-107**	4 (1.2)	A	40.0	40.4	40.8	1.6	33	70	1.08 (28.3)
		UHX6-107H	6 (1.8)	A	43.6	44.0	44.4	1.1	33	80	1.06 (30.7)
		UHX8-107H	8 (2.4)	A	46.0	46.5	46.8	0.8	33	81	1.06 (30.7)*
		UHX10-107H	10 (3.0)	A	48.0	48.4	48.7	0.7	33	85	1.06 (30.7)*
		UHX12-107H	12 (3.7)	A	49.4	49.8	50.2	0.5	33	80	1.06 (30.7)*
High XPD Antennas – TEGLAR Long Life Radome Included											
10.7-11.7 Dual Polarized	CPR90G and PDR100	**HXPD8-107C**	8 (2.4)	A	46.3	46.6	46.8	0.8	36	75	1.08 (28.3)
		HXPD10-107C	10 (3.0)	A	47.5	47.8	48.1	0.7	36	75	1.08 (28.3)
UHX® Ultra Gain Antenna – Planar Radome Included											
10.7-11.7 Dual Polarized	CPR90G and PDR100	**UGX10R-107E**	10 (3.0)	A	48.6	49.0	49.4	0.6	36	70	1.06 (30.7)

*VSWR of 1.04 (34.2) available on special order. ‡ Part 21.

10.7-11.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S FCC Standard‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Low VSWR Standard Antennas											
10.7-11.7	CPR90G	**PL4-107D**	4 (1.2)	B	40.1	40.5	40.9	1.6	30	46	1.06 (30.7)
Single	and	**PL6-107D**	6 (1.8)	B	43.6	44.0	44.4	1.0	30	51	1.04 (34.2)
Polarized	PDR100	**PL8-107E**	8 (2.4)	B	46.0	46.4	46.8	0.8	30	53	1.04 (34.2)
		PL10-107E	10 (3.0)	A	47.8	48.2	48.5	0.7	30	55	1.04 (34.2)
		PL12-107F	12 (3.7)	B	49.4	49.8	50.2	0.5	30	60	1.04 (34.2)
10.7-11.7	CPR90G	**PXL6-107C**	6 (1.8)	B	43.6	44.0	44.4	1.0	30	49	1.08 (28.3)
Dual	and	**PXL8-107C**	8 (2.4)	B	46.0	46.4	46.8	0.8	30	50	1.06 (30.7)
Polarized	PDR100	**PXL10-107C**	10 (3.0)	B	47.9	48.3	48.6	0.7	30	52	1.06 (30.7)
		PXL12-107D	12 (3.7)	B	49.4	49.8	50.2	0.5	30	53	1.06 (30.7)

‡ Part 21.

12.2-12.7, 12.2-13.25 and 12.7-13.25 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category or Standard‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHXII® Ultra High Performance Antennas – TEGLAR® Long Life Radome Included											
12.7-13.25	WR75	**UHX8-127H**	8 (2.4)	A	47.5	47.6	47.8	0.7	32	80	1.10 (26.4)
Dual	choke and	**UHX10-127H**	10 (3.0)	A	48.7	48.8	49.0	0.6	30	82	1.10 (26.4)
Polarized	cover										
High Performance Antennas – Planar Radome Included											
12.2-13.25	WR75	**HP6-122D**	6 (1.8)	A	44.7	45.1	45.4	0.9	30	70	1.08 (28.3)
Single	choke	**HP8-122D**	8 (2.4)	A	47.2	47.6	47.9	0.7	30	70	1.08 (28.3)
Polarized	and	**HP10-122D**	10 (3.0)	A	48.4	48.8	49.1	0.6	28	71	1,08 (28.3)
	cover	**HP12-122E**	12 (3.7)	A	50.6	50.9	51.2	0.5	30	71	1.08 (28.3)
12.2-12.7	WR75	**HPX6-122D**	6 (1.8)	A	44.6	44.8	45.0	0.9	30	68	1.10 (26.4)
Dual	choke	**HPX8-122D**	8 (2.4)	A	47.1	47.3	47.5	0.7	30	70	1.10 (26.4)
Polarized	and	**HPX10-122C**	10 (3.0)	A	48.4	48.5	48.7	0.6	25	71	1.10 (26.4)
	cover	**HPX12-122C**	12 (3.7)	A	50.5	50.6	50.8	0.5	25	71	1.10 (26.4)
12.7-13.25	WR75	**HPX6-127D**	6 (1.8)	A	45.0	45.1	45.3	0.9	30	68	1.10 (26.4)
Dual	choke	**HPX8-127D**	8 (2.4)	A	47.5	47.6	47.8	0.7	30	70	1.10 (26.4)
Polarized	and	**HPX10-127C**	10 (3.0)	A	48.7	48.8	49.0	0.6	25	71	1.10 (26.4)
	cover	**HPX12-127C**	12 (3.7)	A	50.8	50.9	51.1	0.5	25	72	1.10 (26.4)
Standard Antennas											
12.2-13.25	WR75	**P4-122D**	4 (1.2)	B	41.2	41.5	41.9	1.4	30	49	1.10 (26.4)
Single	choke	**P6-122D**	6 (1.8)	*	44.7	45.1	45.4	0.9	30	53	1.08 (28.3)
Polarized	and	**P8-122D**	8 (2.4)	*	47.2	47.6	47.9	0.7	30	55	1.08 (28.3)
	cover	**P10-122E**	10 (3.0)	A	48.4	48.8	49.1	0.6	26	57	1.08 (28.3)
		P12-122E	12 (3.7)	A	50.6	50.9	51.2	0.5	30	58	1.08 (28.3)
12.2-12.7	WR75	**PX4-122C**	4 (1.2)	B	40.5	40.7	40.9	1.4	25	52	1.10 (26.4)
Dual	choke	**PX6-122C**	6 (1.8)	A	44.6	44.8	45.0	0.9	25	51	1.10 (26.4)
Polarized	and	**PX8-122C**	8 (2.4)	A	47.1	47.3	47.5	0.7	30	54	1.10 (26.4)
	cover	**PX10-122C**	10 (3.0)	A	48.4	48.5	48.7	0.6	30	57	1.10 (26.4)
		PX12-122C	12 (3.7)	A	50.5	50.6	50.8	0.5	25	58	1.10 (26.4)
12.7-13.25	WR75	**PX4-127C**	4 (1.2)	B	40.9	41.0	41.2	1.4	25	52	1.10 (26.4)
Dual	choke	**PX6-127C**	6 (1.8)	*	45.0	45.1	45.3	0.9	25	52	1.10 (26.4)
Polarized	and	**PX8-127C**	8 (2.4)	*	47.5	47.6	47.8	0.7	30	54	1.10 (26.4)
	cover	**PX10-127C**	10 (3.0)	A	48.7	48.8	49.0	0.6	30	57	1.10 (26.4)
		PX12-127C	12 (3.7)	A	50.8	50.9	51.1	0.5	25	58	1.10 (26.4)

*A for 12.2-12.7 and/or 12.7-13.2 GHz; **B** for 13.2-13.25 GHz.

‡ Part 94 for 12.2-12.7 GHz, Part 78 for 12.7-13.2 GHz, and Part 21 for 13.2-13.25 GHz.

P8-144E Standard Antenna with Vertical Tower Mount

HP2-220, 2 ft (0.6 m) High Performance Antenna with Vertical Tower Mount and Planar Radome

System Planning and Accessories Pages

U.S. FCC Pattern Compliance is indicated in the tables.

Vertical Tower Mount is included with all antennas. See pages 84-87 for further information.

Pressurization. Feeds are pressurizable to 10 lb/in^2 (70 kPa).

To Order. Specify *Antenna Type Number*. Refer to page 93 for general ordering information.

12.2 – 13.25 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Category or Standard‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
LD Series Antennas											
12.2-13.25 Single Polarized	WR75 choke and cover	**LD2-122C**	2 (0.6)	**	35.2	35.5	35.9	2.8	25	42	1.12 (24.9)
		LD4-122B	4 (1.2)	B	41.1	41.4	41.7	1.4	20	49	1.10 (26.4)
		LD6-122B	6 (1.8)	*	44.8	45.1	45.3	0.9	20	52	1.10 (26.4)
12.2-13.25 Dual Polarized	WR75 choke and cover	**LDX4-122B**	4 (1.2)	B	40.4	40.8	41.1	1.4	25	48	1.10 (26.4)

*A for 12.2-12.7 and/or 12.7-13.2 GHz, **B** for 13.2-13.25 GHz.

‡ Part 94 for 12.2-12.7 GHz, Part 78 for 12.7-13.2 GHz, and Part 21 for 13.2-13.25 GHz.

**Can be used in some instances per paragraph 94.90 of FCC Rules and Regulations.

14.4-15.35 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
Standard Antennas										
14.4-15.35 Single Polarized	UG-419/U UBR140 and PBR140	**P2-144D**	2 (0.6)	36.2	36.5	36.7	2.3	30	42	1.10 (26.4)*
		P4-144D	4 (1.2)	42.3	42.5	42.8	1.2	30	52	1.10 (26.4)*
		P6-144D	6 (1.8)	45.8	46.1	46.3	0.8	30	55	1.10 (26.4)*
		P8-144E	8 (2.4)	48.3	48.6	48.9	0.6	30	57	1.10 (26.4)*
		P10-144E	10 (3.0)	50.2	50.5	50.8	0.5	30	58	1.10 (26.4)*
14.4-15.35 Dual Polarized	UG-419/U UBR140 and PBR140	**PX4-144C**	4 (1.2)	42.3	42.5	42.8	1.2	30	48	1.10 (26.4)*
		PX6-144C	6 (1.8)	45.8	46.1	46.3	0.8	30	55	1.10 (26.4)*
		PX8-144D	8 (2.4)	48.3	48.6	48.9	0.6	30	57	1.10 (26.4)*
		PX10-144D	10 (3.0)	50.2	50.5	50.8	0.5	30	58	1.10 (26.4)*

*Lower VSWR available on request.

17.7 – 19.7 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Class‡	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas – TEGLAR® Long Life Radome Included											
17.7-19.7 Single Polarized	UG-595/U UBR220 and PBR220	**HP2-180E**	2 (0.6)	A	38.4	38.9	39.4	1.8	32	65	1.15 (23.1)
		HP4-180E	4 (1.2)	A	44.4	44.9	45.4	0.9	30	66	1.15 (23.1)
		HP6-180E	6 (1.8)	A	48.0	48.5	48.9	0.6	33	76	1.15 (23.1)
17.7-19.7 Dual Polarized	UG-595/U UBR220 and PBR220	**HPX2-180**	2 (0.6)	A	38.4	38.9	39.4	1.9	36	65	1.20 (20.8)
		HPX4-180	4 (1.2)	A	44.0	44.5	45.0	1.0	31	67	1.20 (20.8)
		HPX6-180	6 (1.8)	A	47.4	47.9	48.3	0.7	35	72	1.20 (20.8)

‡Parts 21 and 94.

21.2 – 23.6 GHz Antennas — Electrical Characteristics

Frequency GHz	Flanges Mate with	Type Number	Diameter ft (m)	U.S. FCC Standard	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
High Performance Antennas – TEGLAR® Long Life Radome Included											
21.2-23.6 Single Polarized	UG-595/U UBR220 and PBR220	**HP2-220**	2 (0.6)	A	40.0	40.5	41.0	1.5	34	65	1.15 (23.1)
		HP4-220A	4 (1.2)	A	45.8	46.3	46.8	0.8	30	66	1.15 (23.1)
		HP6-220	6 (1.8)	A	49.3	49.7	50.2	0.5	31	80	1.15 (23.1)

Type UMX10-459B Antenna with extended pipe and waveguide support kit, vertical tower mount, antenna ice shield and bottom strut.

System Planning and Accessories

Dual band antennas permit expansion of existing frequency-congested routes using one antenna to provide a second frequency band of operation, in many cases without increasing the windloading on the tower.

Polarization. Two port antennas have single polarization in each port and the two ports are orthogonally polarized. Three port (-186 Series) have single polarization at 2 GHz and dual polarization at 6.5 GHz. Four port antennas have dual polarization in both bands.

U.S. FCC Pattern Compliance is indicated in the table on page 80.

Input Flange Information

Band, GHz	Termination Load*	Flange Mates with
2	**43734**	7/8″ EIA, 50 ohm
4	**62901-229**	CPR229G, PDR40
6	**62901-137**	CPR137G, PDR70
6.5 (UMX and Two Port)	**62901-137**	CPR137G, PDR70
6.5 (HPX12-6511C)	**62900-137**	PAR70, CAR70, PDR70, UG-343B/U, UG-344/U
7 and 8	**62901-112**	CPR112G, PDR84
11	**62901-90**	CPR90G, PDR100

*For an unused antenna port

Pressurization

Antenna	Pressure Rating Max. lb/in² (kPa)
UMX-459	0.5 (3.5)
UMX-465	5 (35)
UMX-611	5 (35)
HPX12-6511C	5 (35)
PL-186	2 (14)
All Others	10 (70)

UMX® Multiband Antennas

UMX multiband antennas provide simultaneous dual-frequency band, dual polarized (4-port) operation in the 4/6 GHz, 4/6.5 GHz or 6/11 GHz bands.

Size, weight, windload characteristics and tower interface requirements are similar to other Andrew shielded antennas of equivalent size. UMX antennas can, in general, be used as direct replacements for existing HP, HPX, and UHX series antennas. Multiband antennas offer significant savings in installation and tower costs compared with multiple single band antennas. In a typical application, a single band microwave route can be

Type UMX10-459B Antenna with standard pipe vertical tower mount and combiner ice shield.

expanded to dual band operation with minimum tower modification and cost.

4/6 GHz Antennas (UMX-459 Series) include a feed, shielded reflector and TEGLAR® long-life radome. The 4-port combining network with circulators and vertical tower mount are ordered separately from the table on page 80.

4/6.5 GHz Antennas (UMX-465 Series) include a feed, shielded reflector, TEGLAR long-life radome, 4-port combining network and vertical tower mount.

6/11 GHz Antennas (UMX-611 Series) include a feed, shielded reflector, TEGLAR long-life radome, 4-port combining network and vertical tower mount.

4-Port Combining Networks. Andrew's compact 4-port combining networks offer low VSWR and high frequency-band and polarization isolation. The 4/6 GHz combiner has test ports to allow antenna realignment without traffic interruption. Circulators are included where specified in the ordering information table on page 80. Gain and port isolation specifications include losses contributed by the circulators where applicable. The use of circulators limits each antenna port to transmit or receive-only operation.

Input Power Rating is 100 watts per port.

Isolation, dB minimum.

4/6 GHz Antennas

4 GHz port-to-port	40
6 GHz port-to-port	40
4 GHz at 6 GHz ports	Below Cutoff
6 GHz at 4 GHz ports	50

4/6.5 GHz Antennas

4 GHz port-to-port	40
6.5 GHz port-to-port	40
4 GHz at 6.5 GHz ports	Below Cutoff
6.5 GHz at 4 GHz ports	50

6/11 GHz Antennas

6 GHz port-to-port	35
11 GHz port-to-port	35
6 GHz at 11 GHz ports	Below Cutoff
11 GHz at 6 GHz ports	35

Vertical Tower Mount. 6/11 GHz antennas (10 ft) include a Type T10SB mount with two side struts. 4/6.5 GHz antennas (12 ft) include a T12SA mount. Mounts for 4/6 GHz antennas are listed in the table on page 80 and include one 10.5 ft (3.2 m) and one 16 ft (4.9 m) side strut. The "standard" and "extended pipe" versions differ in the waveguide support hardware supplied. The "standard" version attaches the antenna to a standard length 4.5 in (115 mm) diameter pipe. Customer supplied lengths (10-12 ft; 3-3.6 m) of 1.5 in (38 mm) pipe are required for attachment of the included waveguide supports. The "extended pipe" version requires an extended length (10-12 ft; 3-3.6 m)of 4.5 in (115 mm) diameter pipe for attachment of the waveguide supports. For most applications, the "extended pipe" version simplifies waveguide installation.

Ice Shield. For 4/6 GHz antennas, protects 4-port combining network from falling ice. It will sustain the impact of a 10 lb (4.5 kg) piece of ice falling from a height of 50 ft (15 m).

Other Dual Band Antennas Series

Mounts. All antennas listed, except UMX-459 Series, include a vertical tower mount. See ordering information table on page 80 for UMX-459 Series mounts.

Radomes. HP Series include a Hypalon coated nylon planar radome. Optional molded radomes are available for PL Series. UMX antennas include a TEGLAR long life radome.

To Order

Specify antenna Type Number. Also, for UMX-459 series, specify Type Number for mount, 4-port combining network and ice shield. See ordering information table at bottom of page 80.

Dual Band Antennas – Electrical Characteristics

Frequency GHz	Type Number	Diameter Feet (m)	U.S. FCC Class.	Band	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B dB	VSWR, max (R.L., dB)
UMX® Multiband Antennas – Four Port, TEGLAR® Radome Included											
3.7-4.2 and	**UMX10-459B**	10 (3.0)	A†	4	38.4	39.0	39.4	1.8	30	72	1.06 (30.7)
5.925-6.425			A†	6	42.8	43.1	43.5	1.1	30	78	1.06 (30.7)
3.7-4.2 and	**UMX12-459A***	12 (3.7)	A†	4	40.7	41.3	41.5	1.5	30	74	1.06 (30.7)
5.925-6.425			A†	6	44.9	45.3	45.7	0.9	30	80	1.06 (30.7)
3.58-4.2 and	**UMX12-A465***	12 (3.7)	A†	4	40.3	40.9	41.5	1.7	30	73	1.12 (24.9)
6.425-7.125			A‡	6.5	44.5	45.0	45.4	0.95	30	78	1.12 (24.9)
3.58-4.2 and	**UMX12-B465***	12 (3.7)	A†	4	40.3	40.9	41.5	1.7	30	73	1.10 (26.4)
6.425-7.125			A‡	6.5	44.3	44.8	45.2	0.95	30	78	1.06 (30.7)
5.925-6.425 and	**UMX10-611A**	10 (3.0)	A†	6	42.0	42.2	42.5	1.4	30	67	1.13 (24.3)**
10.7-11.7			A†	11	47.0	47.4	47.3	0.8	30	70	1.13 (24.3)**
High Performance Antenna – Four Port, Planar Radome Included											
6.425-7.125 and	**HPX12-6511C***	12 (3.7)	B‡	6	43.5	44.0	44.5	0.9	33	70	1.12 (24.9)
10.7-11.7			A†	11	47.0	48.0	47.0	0.6	33	70	1.22 (20.1)
High Performance Antennas – Two Port, Planar Radome Included											
5.925-6.425 and	**HP8-611D**	8 (2.4)	A†	6	40.9	41.3	41.6	1.4	35	65	1.06 (30.7)
10.7-11.7			A†	11	44.3	44.7	45.1	0.8	25	70	1.10 (26.4)
5.925-6.425 and	**HP10-611E**	10 (3.0)	A†	6	42.7	43.0	43.2	1.1	30	72	1.06 (30.7)
10.7-11.7			A†	11	46.1	45.8	46.2	0.7	25	72	1.10 (26.4)
5.925-6.425 and	**HP12-611F**	12 (3.7)	A†	6	44.3	44.7	45.0	0.9	28	67	1.06 (30.7)
10.7-11.7			A†	11	46.9	47.3	47.7	0.5	25	72	1.10 (26.4)
7.125-7.725 and	**HP10-782C*****	10 (3.0)	—	7	44.2	44.5	44.8	1.0	32	67	1.06 (30.7)
8.275-8.500			—	8	45.4	45.5	45.6	0.8	30	65	1.06 (30.7)
	HP12-782C***	12 (3.7)	—	7	45.8	46.2	46.6	0.8	30	70	1.06 (30.7)
			—	8	47.0	47.1	47.2	0.7	30	70	1.06 (30.7)
	HP15-782C***	15 (4.6)	—	7	47.5	47.8	48.2	0.7	30	70	1.06 (30.7)
			—	8	48.7	48.8	48.9	0.6	30	70	1.06 (30.7)
Low-VSWR Standard Antennas – Three Port											
1.85-1.99 and	**PL8-186C**	8 (2.4)	A‡	2	30.5	30.8	31.1	4.5	20	39	1.10 (26.4)
6.425-7.125			A‡	6.5	41.6	42.0	42.5	1.3	30	49	1.08 (28.3)
1.85-1.99 and	**PL10-186C**	10 (3.0)	A‡	2	32.5	32.8	33.1	3.7	20	42	1.10 (26.4)
6.425-7.125			A‡	6.5	43.7	44.0	44.4	1.0	30	52	1.08 (28.3)

*One piece reflector.
**VSWR of 1.06 with optional circulators. Circulators limit antenna ports to transmit or receive only. Gain specifications do not include 0.2 dB circulator losses.
***Low VSWR standard version available on request.
† Part 21
‡ Part 94

Multiband Antenna Accessory Ordering Information

Multiband Antenna Diameter, ft (m)	Type No.	4-Port Combining Network Type No.	Circulators	Vertical Tower Mounts Standard Type No.	Vertical Tower Mounts Extended Pipe Type No.	Combiner Ice Shield Type No.
10 (3.0)	**UMX10-459B**	**200816**	**Incl. 4 Ports**	**203978**	**203978-2**	**200480**
12 (3.7)	**UMX12-459A**	**200816**	**Incl. 4 Ports**	**203979**	**203979-2**	**200481**
12 (3.7)	**UMX12-A465**	**Included**	**None Incl.**	**Included**	—	—
	UMX12-B465	**Included**	**Incl. 6 GHz only**	**Included**	—	—
10 (3.0)	**UMX10-611A**	**Included**	**None Incl.** **206267†† (6 GHz)** **206269†† (11 GHz)**	**Included**	—	—

†† Kit of 2 each.

10 ft (3 m) UHXII® Ultra High Performance Antenna with TEGLAR Radome

Radomes are used to protect microwave antennas against accumulation of ice, snow, and dirt and to reduce wind-loading. All Andrew shielded antennas and SHX® super high performance antennas include a flexible planar radome. Antennas which include a radome are indicated in the antenna specification tables on pages 58-80. Optional molded radomes, listed on pages 82 and 83, are available for most other solid reflector standard parabolic antennas.

Flexible Planar Radomes

All Andrew shielded antennas include a flexible planar radome stretched across the opening of the shield. The radome flexes slightly in the wind readily shedding ice and snow in most environments.

Using a polymer-coated fabric of extreme durability, the TEGLAR® long-life radome excels in resistance to heat, rain, snow, fungus, ice accumulation, corrosive atmosphere, and ultra-violet light. The polymer surface readily sheds water and dirt. Performance under normal conditions is equal to or better than other designs, and under severe conditions is significantly better.

The TEGLAR long-life radome is included as standard with certain shielded antennas (refer to "Planar Radome Applications" table below). Others include a Hypalon coated nylon radome and the TEGLAR radome is optional at extra cost.

Colors. The standard color for all planar radomes is aviation white.

TEGLAR Radome Replacement Kit. The kits listed below include one TEGLAR radome and hardware to replace an existing Andrew planar radome.

Replacement Kit Type Numbers

Antenna Diameter, ft (m)	TEGLAR Radome Kit Aviation White
2 (0.6)	**207105**
4 (1.2)	**207106**
6 (1.8)	**45665-1**
8 (2.4)	**45665-2**
10 (3.0)	**45665-3**
12 (3.7)	**45665-4**
15 (4.6)	**45665-5**

Planar Radome Applications

Antenna Type	Planar Radome Included
UHX, UGX, HP, HPX Series (except those listed below)	Hypalon (TEGLAR is optional)
UHX II, HXPD, UHX ( ) X Series, UMX, High XPD Antennas	TEGLAR
HP ( )-180 and HP ( )-220 Series	TEGLAR
SHX Super High Performance Antennas	TEGLAR
HP( )-21 Series	TEGLAR

8 ft (2.4 m) Standard Antenna with Optional Molded Radome Type R8E

8 ft (2.4 m) Focal Plane Antenna with Optional Molded Radome Type FR8

Molded Radome Attenuation and VSWR

Radome Type	Diameter ft (m)	Attenuation* 2 GHz	6 GHz	11 GHz	13 GHz	Add to Antenna VSWR 2 GHz	6 GHz	11 GHz	13 GHz
Standard Antenna Radomes									
Standard	2 (0.6)	0.1	0.4	1.0	1.2	0.02	0.03	0.05	0.05
Standard	4 (1.2)	0.1	0.4	1.2	1.5	0.02	0.03	0.05	0.05
Standard	6 (1.8)	0.1	0.5	1.4	1.7	0.02	0.03	0.03	0.03
Standard	8 (2.4)	0.1	0.6	1.5	1.8	0.02	0.03	0.03	0.03
Standard	10 (3.0)	0.2	0.9	1.8	2.1	0.02	0.03	0.03	0.03
Standard	12 (3.7)	0.2	1.0	1.9	2.2	0.02	0.03	0.03	0.03
Extra Strentgh	6 (1.8)	0.2	0.8	1.8	2.1	0.02	0.03	0.03	0.03
Extra Strength	8 (2.4)	0.2	0.9	1.8	2.1	0.02	0.03	0.03	0.03
Extra Strength	10 (3.0)	0.3	1.2	2.0	2.2	0.02	0.03	0.03	0.03
Extra Strength	12 (3.7)	0.3	1.4	2.0	2.3	0.02	0.03	0.03	0.03
Focal Plane Antenna Radomes									
Standard	4 (1.2)	0.1	0.4	—	—	0.03	0.03	—	—
Standard	6 (1.8)	0.1	0.5	—	—	0.03	0.03	—	—
Standard	8 (2.4)	0.1	0.6	—	—	0.03	0.03	—	—
Standard	10 (3.0)	0.2	0.9	—	—	0.03	0.03	—	—
Standard	12 (3.7)	0.2	1.0	—	—	0.03	0.03	—	—
Extra Strength	4 (1.2)	0.1	0.4	—	—	0.05	0.05	—	—
Extra Strength	6 (1.8)	0.2	0.8	—	—	0.05	0.05	—	—
Extra Strength	8 (2.4)	0.2	0.9	—	—	0.05	0.05	—	—
Extra Strength	10 (3.0)	0.3	1.2	—	—	0.05	0.05	—	—
Extra Strength	12 (3.7)	0.3	1.4	—	—	0.05	0.05	—	—

*Guaranteed within 0.15 dB.

Molded Radomes

Optional molded radomes are available for most Andrew standard antennas to protect against accumulation of ice, snow and dirt, and to reduce windloading. Depending on antenna size or type, molded radomes are either conical, parabolic or spherical in shape, and are clamped or bolted to the rim of the reflector. Andrew molded radomes are highly resistant to ultraviolet rays and provide high reliability under severe environmental conditions.

Unheated radomes offer suitable protection for most installations. In areas subject to severe sleet or heavy snow, heated radomes are recommended. Heated radomes have nichrome wires molded between layers and include an air-sensing thermostat to energize the heaters in the critical icing range from −6° to +3°C (22° to 38 °F).

Except for the special 890 – 2700 MHz versions, the heating wires are laid in a helical pattern to eliminate the need for polarization alignment, and to accommodate dual-polarized operation with negligible added loss.

Electrical Characteristics. Attenuation and system VSWR effects are listed in the table on page 82. To determine the maximum VSWR across the band for the antenna/radome combination, add the figure from the table to the maximum antenna VSWR.

Colors. The standard color is dark gray. Aviation white and aviation orange are available on request.

To Order. Specify type number from tables below. The radomes listed in Table 1 fit most Andrew standard parabolic (unshielded) and focal plane antennas with the following exceptions:

- Antennas listed in Table 2 require the listed "special application molded radomes."
- Radomes are not available for 15 ft (4.6 m) standard antennas.
- Heated radomes are not available for dual polarized 890-2700 MHz standard antennas.

Table 1 Molded Radomes – Ordering Information

Radome Type	Diameter ft (m)	Unheated Type No.	Heated 3.5 GHz & Up Type No.	Heated 890-2700 MHz* Type No.	Heated Radome Watts	Power Requirements Input Voltage
Standard Antenna Radomes						
Standard	2 (0.6)	**R2D**	**HR2E**	—	125	120V, 50/60 Hz
Standard	4 (1.2)	**R4D**	**HR4D**	**39180**	770	120/240V, 50/60 Hz
Standard	6 (1.8)	**R6D**	**HR6D**	**39181**	1525	120/240V, 50/60 Hz
Standard	8 (2.4)	**R8E**	**HR8G**	**39182**	3300	120/240V, 50/60 Hz
Standard	10 (3.0)	**R10E**	**HR10G**	**39183**	4250	120/240V, 50/60 Hz
Standard	12 (3.7)	**R12F**	**HR12F**	**39184**	6000	240V, 50/60 Hz
Extra Strength	6 (1.8)	**39191A**	**39196**	—	1525	120/240V, 50/60 Hz
Extra Strength	8 (2.4)	**39192**	**39197**	—	3300	120/240V, 50/60 Hz
Extra Strength	10 (3.0)	**39193**	**39198**	—	4250	120/240V, 50/60 Hz
Extra Strength	12 (3.7)	**39194**	**39199**	—	6000	240V, 50/60 Hz
Focal Plane Antenna Radomes						
Standard	4 (1.2)	**FR4**	**FHR4**	—	850	120/240V, 50/60 Hz
Standard	6 (1.8)	**FR6**	**FHR6**	—	1525	120/140V, 50/60 Hz
Standard	8 (2.4)	**FR8**	**FHR8**	**102733**	3050	120/240V, 50/60 Hz
Standard	10 (3.0)	**FR10**	**FHR10**	**102735**	3650	120/240V, 50/60 Hz
Standard	12 (3.7)	**FR12**	**FHR12**	**102737**	6000	240V, 50/60 Hz
Extra Strength	4 (1.2)	**FR4-E**	**FHR4-E**	—	850	120/240V, 50/60 Hz
Extra Strength	6 (1.8)	**FR6-E**	**FHR6-E**	—	1525	120/240V, 50/60 Hz
Extra Strength	8 (2.4)	**FR8-E**	**FHR8-E**	—	3050	120/240V, 50/60 Hz
Extra Strength	10 (3.0)	**FR10-E**	**FHR10-E**	—	3650	120/240V, 50/60 Hz
Extra Strength	12 (3.7)	**FR12-E**	**FHR12-E**	—	6000	240V, 50/60 Hz

*For single-polarized antennas only. Heated radomes not available for dual-polarized 890–2700 MHz antennas.

Table 2 Special Application Molded Radomes – Ordering Information

	Diameter ft (m)	Unheated Type No.	Heated Type No.	Heated Radome Watts	Heated Radome Input
PXL6-59D, PXL6-65D, PXL6-71E	6 (1.8)	**35255-2**	**35254-2**	1525	120/240V, 50/60 Hz
Dual Pol. Standard 2700 MHz and Below	8 (2.4)	**77025**	—	—	—
Dual Pol. Standard 2700 MHz and Below	12 (3.7)	**76496**	—	—	—
P8-144E, PX8-144E	8 (2.4)	**35257-41**	**35256-46**	3300	120/240V, 50/60 Hz
P10-144E, PX10-144E	10 (3.0)	**35259-42**	**35258-47**	4250	120/240V, 50/60 Hz

The vertical tower mounts described on pages 84-86 are provided with all parabolic microwave antennas listed on pages 58-80 except UMX-459 series. Mounts attach to a tower supported vertical pipe of the diameter specified on page 86. Structural and fixed hardware are galvanized steel. Mounts with an "M" suffix have metric hardware. The "M" suffix mounts are supplied from Great Britain and are available from other locations on special order. Reference mounting dimensions are presented in Figure 1 and the table on page 85.

Adjusting Hardware. Mounts with "S" in the Type Number include stainless steel adjusting rods with brass or stainless steel nuts.

Azimuth and Elevation Adjustments. The adjustment ranges are indicated in the table on page 86. Some mounts, as noted in the table, use a swivel clamp for azimuth adjustment. Adjustment range for these is 360°.

All mounts except those for the 2 ft (0.6 m) LD series, 4 and 6 ft (1.2 and 1.8 m) grid, and the mini GRIDPAK™ antennas have threaded fine elevation adjustment.

Side Struts. Some mounts include one, two or three side struts. The number supplied with each mount is indicated in the table on page 86. Where one side strut is supplied, it includes a stainless steel threaded rod azimuth adjustment. Where two or three side struts are supplied, one is adjustable and the others are fixed.

Optional Side Struts are listed on page 87.

Figure 2
Side Strut Positioning

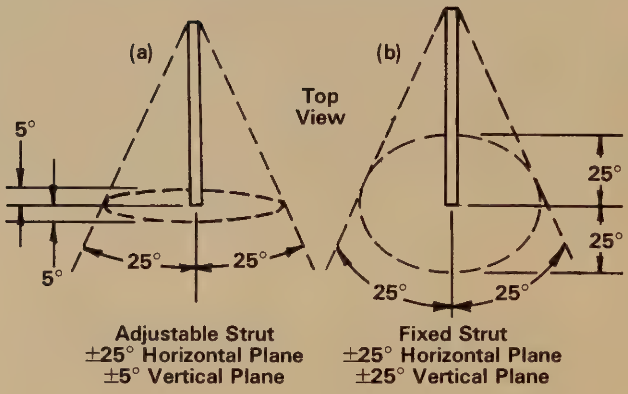
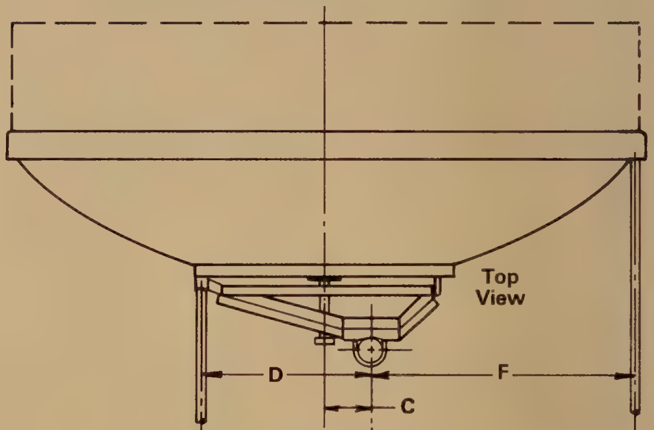
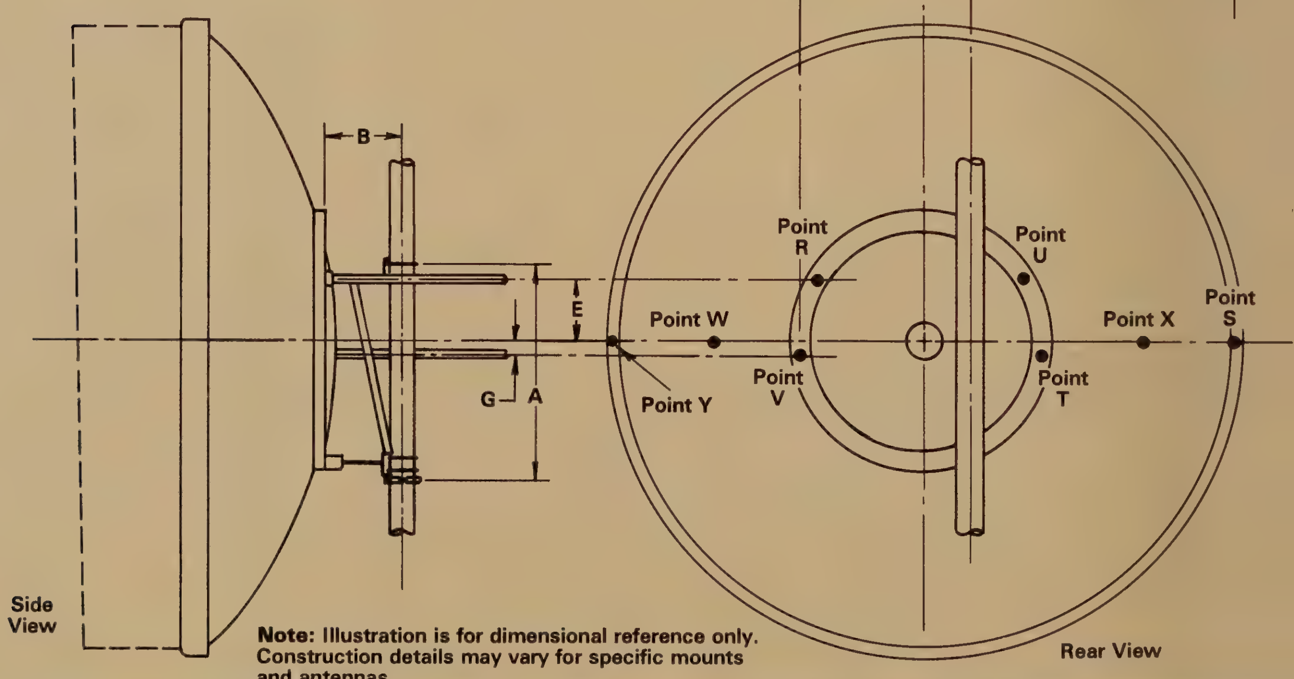


Figure 1
Mounting Dimensions for Parabolic Microwave Antennas





Note: Illustration is for dimensional reference only. Construction details may vary for specific mounts and antennas.

Side Strut Positioning

For maximum windload capability, side struts should be installed straight back to the tower. When this is not possible, the following guidelines apply:

When only one side strut is provided, its angle should not exceed ±25° in the horizontal plane and ±5° in the vertical plane. See Figure 2(a).

See Figures 2(a) and 2(b) for mounts with two side struts. The adjustable side strut can be lowered or raised 5° from horizontal. The fixed side strut can be raised or lowered up to 25°. In the horizontal plane, both side struts can be positioned at an angle up to 25°. Further, the strut closest to the mounting pipe can be positioned at an angle up to 35°, provided the sum of the angles for both struts does not exceed 50°.

Mount Pictures

Typical vertical tower mounts are pictured on the following pages:

Mount Type	Page No.
6 ft (1.8 m) GRIDPAK	58
8 ft (2.4 m) Grid	62
T10 Series (T12 is similar)	68
HP2	76

Dimensions in inches (mm) – Refer to Figure 1

Antenna Diameter ft (m)	A	B	C	Adjusting Strut D	Adjusting Strut E	Adjusting Strut Attach Point	Fixed Strut F	Fixed Strut G	Fixed Strut Attach Point
Shielded Antennas									
2 (0.6)	17 (430)	9.25 (230)†‡	4.75 (125)	—	—	—	—	—	—
4 (1.2)*	23.5 (595)	14.25 (360)	5.4 (140)	—	—	—	—	—	—
4 (1.2)**	30 (760)	11.75 (300)	5.4 (140)	—	—	—	—	—	—
6 (1.8)*	31.5 (800)	16.25 (415)	8 (200)	26.75 (680)	10.75 (275)	R	10.75 (275)	–2.25 (60)	T††
6 (1.8)**	37.5 (950)	13 (330)	8 (200)	26.75 (680)	10.75 (275)	R	10.75 (275)	–2.25 (60)	T††
8 (2.4)	37.5 (950)	13 (330)	8 (200)	26.75 (680)	10.75 (275)	R	43.25 (1110)	0	S
10 (3.0)	37.5 (950)	13 (330)	8 (200)	26.75 (680)	10.75 (275)	R	55.75 (1415)	0	S
12 (3.7)	48.25 (1225)	13 (330)	8.5 (215)	32.75 (835)	14 (355)	R	67.25 (1710)	0	S
15 (4.6)	73.75 (1875)	15.25 (390)	–8 (–200)	51.5 (1310)	23.5 (595)	U	—	—	—
Standard Antennas and Focal Plane Antennas									
2 (0.6) LD	—	3.25 (85)	5 (127)	—	—	—	—	—	—
2 (0.6) P	17.5 (445)	7.5 (190)	4.75 (120)	—	—	—	—	—	—
4 (1.2) LD & P( )F	25.25 (640)	7 (180)	4.5 (115)	—	—	—	—	—	—
4 (1.2) P	23.25 (590)	11.75 (300)	5.4 (137)	—	—	—	18.75 (475)	2.25 (60)	R††
6 (1.8)	23.25 (590)	11.75 (300)	5.4 (137)	—	—	—	18.75 (475)	2.25 (60)	R††
8 (2.4)	37.5 (950)	13 (330)	8 (200)	26.75 (680)	10.75 (275)	R	10.75 (275)	–2.25 (60)	T††
10 (3.0)	37.5 (950)	13 (330)	8 (200)	26.75 (680)	10.75 (275)	R	10.75 (275)	–2.25 (60)	T††
12 (3.7)	48.25 (1225)	13 (330)	8.5 (215)	32.75 (835)	14 (355)	R	67.25 (1710)	0	S
15 (4.6)	73.75 (1875)	15.25 (390)	–8 (–200)	51.5 (1310)	23.5 (600)	U	—	—	—
Grid Antennas									
4 (1.2)	39 (990)	11.25 (285)	4 (100)	—	—	—	—	—	—
6 (1.8)	25 (635)	11.5 (290)	6.88 (175)	—	—	—	29 (735)	1.5 (40)	W††
8 (2.4)	37 (940)	13.75 (350)	6.88 (175)	39 (990)	1.75 (45)	W	25 (635)	1.75 (45)	X††
10 (3.0)	37 (940)	13.75 (350)	6.88 (175)	39 (990)	2 (50)	W	25 (635)	2 (50)	X††
12 (3.7)	118 (3000)	25.25 (640)	–3.75 (–95)	59 (1500)	2.5 (65)	T	51.25 (1300)	2.5 (65)	V††
15 (4.6)	118 (3000)	29 (740)	–3.75 (–95)	59 (1500)	2.5 (65)	T	51.25 (1300)	2.5 (65)	V
GRIDPAK™ Antennas – 1427 MHz and Above									
4 (1.3)	9.75 (250)	5.25 (130)	4 (100)	—	—	—	—	—	—
6 (1.8)	31.75 (805)	9.0 (230)	6.88 (175)	33 (840)	–5 (–125)	Y	—	—	—
8 (2.4)	41.25 (1045)	10.25 (260)	–6.88 (–175)	41 (1040)	–6 (–150)	Y	—	—	—
10 (3.0)	45.0 (1140)	10.25 (260)	–6.88 (–175)	53 (1345)	–6 (–150)	Y	—	—	—
13 (4.0)	52.0 (1325)	10.75 (275)	–6.88 (–175)	72.5 (1840)	–6.5 (–160)	Y	86.25 (2190)	–6.5 (–160)	S
GRIDPAK Antennas – 960 MHz and Below									
6 (2.0)	29.75 (755)	4.5 (120)‡‡	–4.1 (–105)	—	—	—	—	—	—
10 (3.0)	63.0 (1600)	8.25 (210)‡‡	–4.1 (–105)	27.75 (705)	0	X	—	—	—
13 (4.0)	63.0 (1600)	9 (230)‡‡	–4.1 (–105)	27.75 (705)	0	X	71.5 (1820)	0	W

*-180 and -220 Series
**All except -180 and -220 Series
††Optional side strut, not included.

†Antenna does not have a mounting ring. Dimension is to reflector vertex.
‡Dimension when mounted to 4.5 in (115 mm) mounting pipe.
‡‡Dimension for vertically polarized antenna. Add 2.25 in (60 mm) for horizontally polarized antenna.

Mounting Information

Mechanical data for standard vertical tower mounts is presented below. Mount Type numbers are for reference only. All of the antennas listed on pages 58-80 include a mount, except UMX-459 Series.

Vertical Tower Mounts

Antenna Size, ft (m)	Mount Type Number Inch Standard Hardware	Mount Type Number Metric Standard Hardware	Mounting Pipe Dia. in (mm)	Center Offset* in (mm)	Fine Azimuth Adjustment Degrees	Elevation Adjustment Degrees	Side Struts Included
Shielded Antennas							
2 (0.6)	Integral		2.4 to 4.5 (60 to 115)	4.75 (120)**	±5	–5 to +45††	—
4 (1.2)‡	Integral		4.5 (115)	5.4 (137)	±5	–5 to +50††	—
4 (1.2)‡‡	VT6B	VT6MB	4.5 (115)	5.4 (137)**	±5	–5 to +50††	—
6 (1.8)‡	Integral		4.5 (115)	8 (200) left	±5	–5 to +50††	—
6 (1.8)‡‡	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	1
8 (2.4)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	2
10 (3.0)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	2
12 (3.7)	T12SA†††	T12MSA†††	4.5 (115)	8.5 (215) left	±5	±5	2
15 (4.6)	Integral		4.5 (115)	8 (200) right	±5	±3.6	1
Standard Antennas (except LD and F Series) and Focal Plane							
2 (0.6)	Integral		4.5 (115)	4.75 (120)**	±5	–5 to +45††	—
4 (1.2)	T6SB	T6MSB	4.5 (115)	5.4 (137)**	±5	±5	—
6 (1.8)	T6SB	T6MSB	4.5 (115)	5.4 (137)**	±5	±5	—
8 (2.4)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	1
10 (3.0)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	1
12 (3.7)	T12SA	T12MSA	4.5 (115)	8.5 (215) left	±5	±5	2
15 (4.6)	Integral		4.5 (115)	8 (200) right	±5	±3.6	1
F (unpressurized) and LD Series Antennas							
2 (0.6)	Integral		0.75 to 3 (20 to 75)	5.0 (127)**	***	–5 to +45††	—
4 (1.2)	Integral		4.5 (115)	4.5 (115)**	***	±15	—
6 (1.8)	Integral		4.5 (115)	5.4 (137)**	***	±5	—
8 (2.4)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	1
10 (3.0)	T10SB	T10MSB	4.5 (115)	8 (200) left	±5	±5	1
12 (3.7)	T12SA	T12MSA	4.5 (115)	8.5 (215) left	±5	±5	2
GRIDPAK™ Antennas, 960 MHz and Lower							
Mini	Integral		2.4, 3.5 (60, 90)	4 (100)**	***	±5	—
6 (2)	Integral		2.4, 3.5, 4.5 (60, 90, 115)	4 (100) right	±5	±5	—
10 (3)	Integral		3.5, 4.5 (90, 115)†	4 (100) right	±5	±5	1
13 (4)	Integral		3.5, 4.5 (90, 115)	4 (100) right	±5	±5	2
GRIDPAK Antennas, 1427 MHz and Higher							
4 (1.3)	Integral		4.5 (115)	4 (100)	***	±15	—
6 (2)	Integral		4.5 (115)	6.88 (175)**	±5	±5	1
8 (2.4)	Integral		4.5 (115)	6.88 (175)**	±5	±5	1
10 (3)	Integral		4.5 (115)	6.88 (175)**	±5	±5	1
13 (4)	Integral		4.5 (115)	6.88 (175)**	±5	±5	2
Grid Antennas							
4 (1.2)	Integral		4.5 (115)	4 (100)**	***	±15	—
6 (1.8)	Integral		4.5 (115)	6.88 (175)**	***	±10	—
8 (2.4)	Integral		4.5 (115)	6.88 (175)**	±5	±10	1
10 (3.0)	Integral		4.5 (115)	6.88 (175)**	±5	±10	1
12 (3.7)	Integral		4.5 (115)	3.75 (95) right	±5	±5	1
15 (4.6)	Integral		4.5 (115)	3.75 (95) right	±5	±5	2

*With respect to the mounting pipe viewed from the rear of the antenna. Can be reversed by inverting the mount or antenna.

**Can be offset right or left without inverting the mount or antenna.

***LD6-122B and LD6-105C have ±5°. Others have 360° azimuth capability.

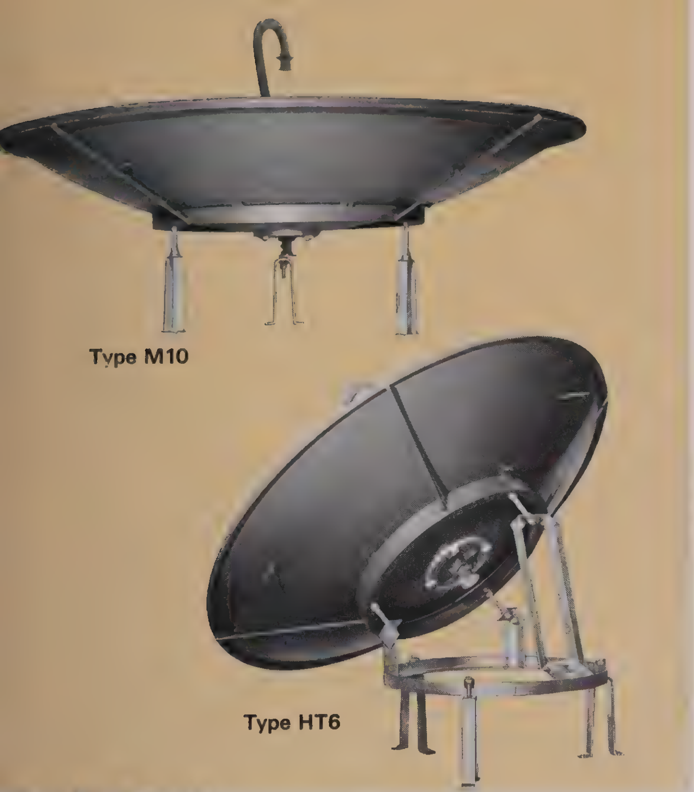
†Types KP10-403 and KP10-820 also attach to a 2.4 in (60 mm) diameter pipe.

††"±"signs can be reversed by inverting mount.

‡-180 and -220 Series.

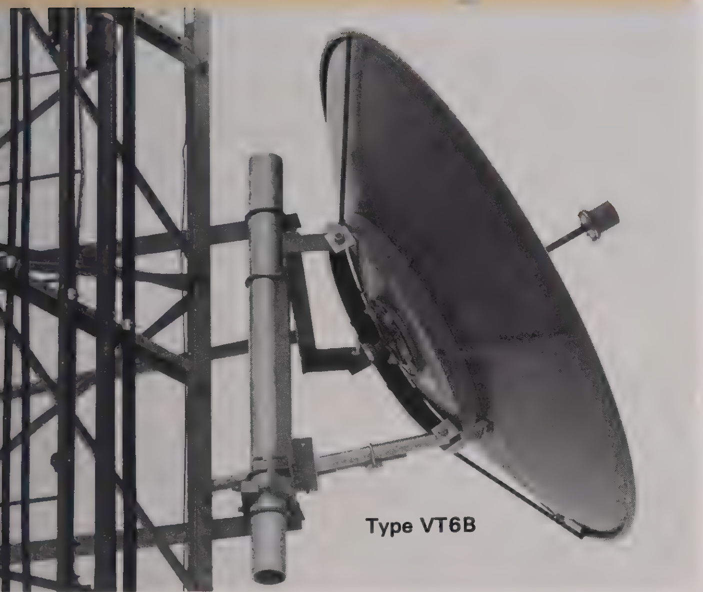
‡‡All except -180 and -220 Series.

†††UHX12-59J has integral mount, also includes a bottom strut and requires a 10 ft (3 m) long mounting pipe.



Type M10

Type HT6



Type VT6B

Optional Struts for Parabolic Antennas

Fixed Side Strut. Provides increased rigidity. Optional for use as a first strut with T6 series mounts or as a second strut for T10 series mounts. Included with all 8-10 ft (2.4-3.0 m) UHX II®, UHX®, HXPD, UGX®, high performance antennas and all 12 ft (3.7 m) antennas.
With inch-standard hardware .... Type **38891A**
With metric-standard hardware .... Type **103720**

Bottom Strut. The optional bottom strut is recommended for high ice-load environments (more than 1 in or 25 mm of hard ice, 55 lb/in^3 or 880 kg/m^3). It can also be used to increase the wind survival rating of 8-12 ft (2.4-3.7 m) shielded antennas. Requires mounting pipe which extends to bottom edge of antenna for optimum mounting.
With inch-standard hardware .... Type **40604**
With metric-standard hardware .... Type **100376**

Optional Fixed Side Struts for Grid Antennas

Antenna Dia. ft (m)	Strut Type Number
6 (1.8)	**75645-1**
8 (2.4)	**201632**
10 (3.0)	**201632-2**
12 (3.7)	**75645-3**

Special-Purpose Mounts

The mounts listed in the table below are alternates to the T series tower mounts listed on page 86. While these are normally used with standard antennas, they can, in many cases, also be used with shielded antennas. Contact your local Andrew Sales Office listed inside the back cover for further information.

Where one side strut is included, it is adjustable. Where two side struts are included, one is adjustable and the other is fixed.

To Order. Specify mount type number from the table below. Also specify antenna "less standard mount" when ordering.

Special-Purpose Mounts for Standard Antennas

Mount Type Number Inch Standard Hardware	Metric Standard Hardware	For Use With Antenna Size, ft (m)	Center Offset* in (mm)	Azimuth Adjustment Degrees	Elevation Adjustment Degrees	Included Side Strut
Horizontal Mounts						
M10	M10M	4-10 (1.2-3.0)	—	—	±5	—
Vertical Tilt Mounts						
VT6B	VT6MB	4, 6 (1.2, 1.8)	5.4 (137) left**	±5	–5 to +50	—
VT10	VT10M	8, 10 (2.4, 3.0)	8 (200) left	±5	–5 to +50	1
Horizontal Tilt Mounts						
HT6	HT6M	4, 6 (1.2, 1.8)	—	360	0 to ±50	—
HT10	HT10M	8, 10 (2.4, 3.0)	—	360	0 to ±50	—

*With respect to the mounting pipe, viewed from the rear of the antenna. Can be reversed by inverting the mount or antenna.

**Can be offset right or left without inverting the mount or antenna.

System Planning and Accessories

SHX super high performance antennas from Andrew offer high gain, low VSWR and outstanding radiation characteristics. These antennas make frequency coordination possible in areas of existing or anticipated congestion where conventional shielded antennas cannot be used. The patented† feed cone design results in E- and H-plane patterns that are nearly symmetrical. This simplifies frequency coordination, by making both polarizations available to the coordinator on every hop.

When equipped with appropriate networks, SHX antennas are capable of operation in several single and multi-band combinations. Two versions are offered:

Type SHX10B1 is available for use in all of the bands listed below.

SHX10C1, is optimized for best overall radiation patterns performance in the 4 and 6 GHz bands.

Electrical Characteristics

Radiation Pattern Envelopes (RPE's) meet U.S. FCC Standard A (Part 21) in the common carrier bands, and Category A (Parts 94 and 78) in the operational fixed and CATV bands. RPE's are available on request.

Cross-Polarization Discrimination is better than 40 dB (30 dB for 2.1-2.2 GHz) at the boresight null and 20 dB minimum over an angle ±2° from boresight.

Inputs mate with the circular waveguide flanges listed below. Transitions from other waveguide sizes are presented on page 198. Type SHX10C1 features removable and interchangeable feed cones for single and dual-band conversions. See system planning information on pages 16-21.

SHX10B1	WC281 Flange
SHX10C1, 4/6 GHz	WC212 Flange
SHX10C1, 6 GHz only	WC166 Flange

†Patented United States 4,410,892 and patents pending in other countries.

Electrical Characteristics

Frequency, GHz	Type Number	Aperture Feet (m)	U.S. FCC Class.	Gain, dBi ±0.5 dB Bottom	Mid-Band	Top	Beamwidth Degrees	F/B Ratio	VSWR, max. (R.L., dB)
2.1-2.2	**SHX10B1**	10 (3.0)	A	32.9	33.1	33.3	3.85	77	1.08 (28.3)
3.7-4.2***	**SHX10B1**	10 (3.0)	A	38.7	39.2	39.7	2.2	90	1.02 (40.1)
	SHX10C1*	10 (3.0)	A	38.7	39.2	39.7	2.1	92	1.04 (34.1)
4.4-5.0	**SHX10B1**	10 (3.0)	‡	40.0	40.5	41.0	1.8	83	1.02 (40.1)
5.925-6.425	**SHX10B1**	10 (3.0)	A	42.3	42.7	43.0	1.4	95	1.02 (40.1)
	SHX10C1*	10 (3.0)	A	42.3	42.7	43.0	1.4	95	**
6.425-7.125	**SHX10B1**	10 (3.0)	A	43.2	43.6	44.0	1.2	90	1.02 (40.1)
7.725-8.275	**SHX10B1**	10 (3.0)	‡	44.4	44.7	45.0	1.1	90	1.02 (40.1)
10.7-11.7	**SHX10B1**	10 (3.0)	A	47.3	47.7	48.1	0.8	91	1.02 (40.1)
12.7-13.25	**SHX10B1**	10 (3.0)	A	48.3	48.5	48.7	0.7	98	1.02 (40.1)

*Specify 3.7-4.2 and 5.925-6.425 GHz or 5.925-6.425 GHz only.
**Maximum VSWR is 1.04 (34.1 dB) with WC212 input (4/6 GHz) and 1.03 (36.6 dB) with WC166 input (6 GHz only).
***3.54-4.2 GHz is also available on request.
‡Does not apply.

2 GHz Operation (SHX10B1) requires the addition of the WC281 to 7/8" EIA, 50 ohm transition listed below. Types HJ7P-50A and HJ7SP-50A HELIAX® cables provide an adequate pressure path to the antenna and are recommended for most applications. Type HJ5P-50 is also suitable, but requires a separate pressure line from the pressurization equipment to the antenna. 1/2" tubing (see page 284) is suitable for lengths up to 100 feet (30 m).

WC281 to 7/8" EIA, 50 ohm Dual Polarized Transition permits connection of HELIAX coaxial cable to SHX10B1 for 2 GHz operation. Installed length is 20 in (510 mm) .... Type **203105**

Termination Load for unused port, 2.1-2.2 GHz, 7/8" EIA, 50 ohm flange .... Type **206326**

Mechanical Characteristics

Construction. All SHX antennas are metal construction and are mechanically interchangeable except for the circular waveguide input flange interface. The antenna structure consists of an aluminum conical horn supported on a galvanized steel mount. The outer shell of the horn is welded with external bracing for added rigidity and load transfer to the mount. A separate precision aluminum reflector is factory installed, precision aligned and protected from damage and degradation due to external forces.

Radome. A TEGLAR® long-life radome is standard. The radome's superior hydrophobic coated surface readily sheds rain, snow, ice and dirt, assuring optimum electrical performance.

Environmental Ratings. The SHX super high performance antenna, including mount, will withstand a 125 mph (200 km/h) wind with 1 in (25 mm) radial ice without damage and will maintain deflection of less than 0.025° in 70 mph (110 km/h) winds. The antenna will remain operational within a temperature range of –40°C to 50°C (–40°F to 122°F), and meet all requirements of EIA Standards RS-222C and RS-195B. SHX10B1 antennas with increased survival ratings are available for use in severe environments.

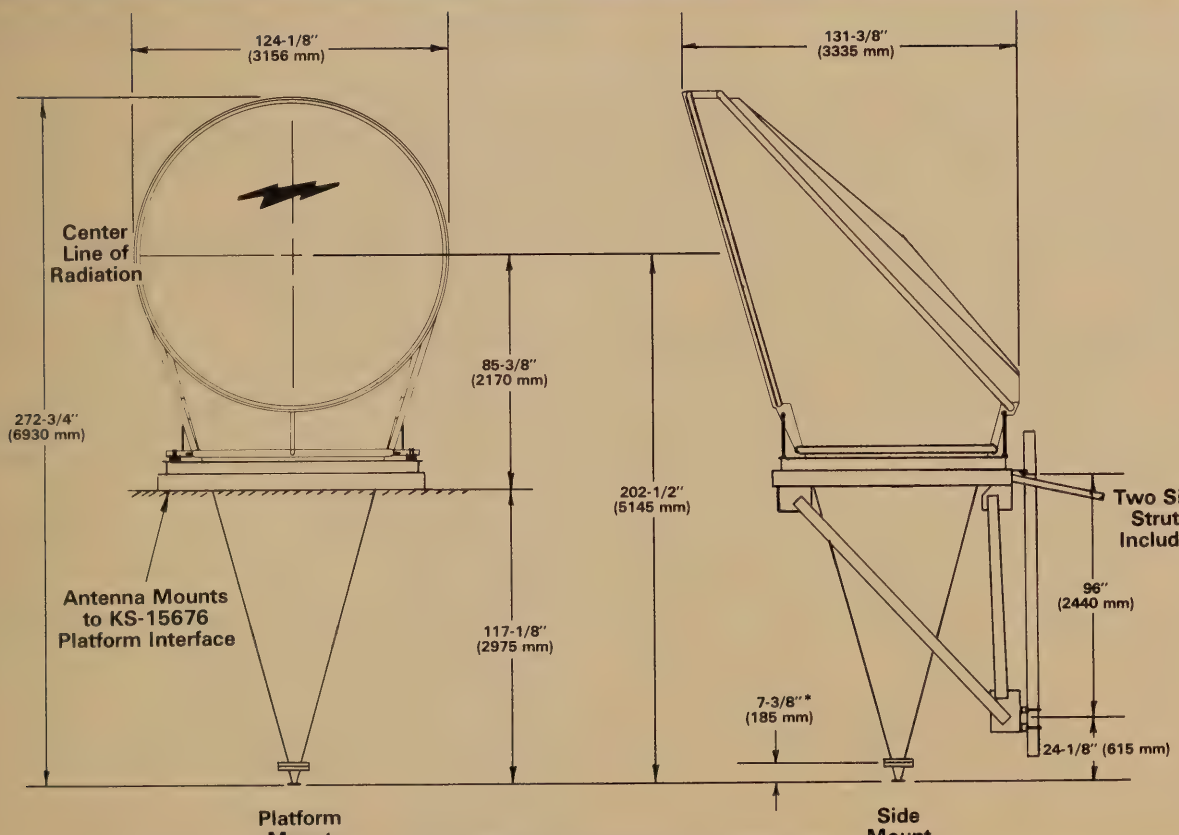
Pressurization. The antenna is pressurizable up to 0.5 lb/in^2 (3.4 kPa). Recommended operating pressure is 0.2 lb/in^2 (1.4 kPa). Maximum leak rate is 10 ft^3/h (283 l/h) at 0.2 lb/in^2 (1.4 kPa). The horn system dehydrator, described on page 280, can pressurize up to three horn antenna systems.

Antenna Colors. Antenna finishes are available in aviation white and aviation orange. Radomes are aviation white.

Shipping Skid. Each SHX antenna is shipped on a returnable steel skid. A deposit is charged, which will be refunded upon return to the point of shipment .... Type **96000**

To Order

Specify *Antenna Type Number* (*SHX10B1* or *SHX10C1*), *shipping skid Type 96000, color* (aviation white or aviation orange) and *mount type number* (*PM10A, TMP10A* or *TMB10A*). For SHX10C1 also specify *"6 GHz single band"* or *"4/6 GHz dual band."*



SHX Antenna Mounting Dimensions

*Applies only to SHX10C1

SHX Antenna with Platform Mount

SHX Antenna with Tower Mount, Upper Access Ring Platform, and Top and Front Access Kit

Mounts for Horn Reflector Antennas

Mounts for the SHX super high performance antenna are ordered separately. Three mount versions are available. For planning considerations, contact your local Andrew Sales Office listed inside the back cover and request Bulletin SP20-05.

Platform Mount. Type **PM10A** is designed to attach the SHX antenna to a KS-15676 platform interface.

Tower Mount, Pipe. Type **TMP10A** attaches the SHX antenna to a vertical, tower-supported, 4-1/2 in (115 mm) diameter, schedule 80 pipe (not supplied). The pipe mount provides an adjustment not available with the platform or beam mounts. It permits rotation of the entire mount about the pipe, if needed, to properly locate the input flange above the circular waveguide supports.

Tower Mount, Beam Type **TMB10A** attaches the SHX antenna to vertical, tower-supported "T" or "I"-Beams or flat plates.

Side Struts. Tower mounts include one 10-1/2 ft (3 m) and one 21 ft (6.4 m) fixed side struts. The struts attach to the tower using 7/8 in bolts. A 15/16 in (24 mm) hole is required for attachment.

Azimuth and Elevation Adjustments. Elevation adjustment range is ±4°. The platform mount has 360° coarse azimuth adjustment. Side mounts have ±90° coarse azimuth adjustment if the mounting pipe or beam is properly positioned. Use antenna adjustment kit listed below for precision alignment on TM_{01} mode null.

Accessories

Antenna Adjustment Kit. Includes tools, guide wheels and accessories necessary for precision azimuth and elevation adjustments. The kit is installed in the field and is removable after adjustment for reuse. One kit is recommended for each end of the microwave path.

Complete Kit .... Type **204527**

Kit of Four Guide Wheels for permanent installation of guide wheels .... Type **204528**

Antenna Adjustment Kit Less Guide Wheels for antennas which have previously installed inside guide wheels .... Type **204526**

Pressure Relief Kit. Relief valve prevents high pressure in the antenna caused by sudden pressure increase due to temperature change .... Type **43849**

Ice Shield. Protects antenna from damage caused by falling ice. Attaches to both side and platform mounted antennas .... Type **49158**

SHX Antenna with Tower Mount, and Upper and Lower Access Ring Platforms

Top and Front Access Kit. Field attachable. Provides accessibility to the top, side, and front of the antenna .... Type **48760**

Includes:

- Vertical rail on the top of the antenna
- Brackets and support at the top and front of the antenna for safety line attachments, allowing front access for radome or antenna top maintenance
- Additional eyebolts on side support members at the top and side of the antenna

Upper Access Ring Platform. Field attachable to Type TMB10A or TMP10A tower mounts. Provides full accessibility around the antenna, simplifying azimuth and elevation adjustment, antenna ring lock down, and maintenance to the lower horn aperture and upper cone .... Type **48973**

Lower Access Ring Platform. Field attachable to and extends below Type 48973 upper access ring platform (described above). Provides full accessibility around the lower cone and feed input area .... Type **48974**

Side Ladder. For access to either side and top of platform mounted antenna. Can be installed on existing antennas .... Type **48971**

Ladder Guide. Additional set of hanger brackets for side ladder. One set is included with the side ladder .... Type **49209**

Waveguide Support Platform for use with tower mount pipe, Type TMP10A. Attaches to 14 ft (4.3 m) long, 4-1/2 in (115 mm) antenna support pipe. Used with waveguide hangers and threaded rod support kit to provide proper support for flex section and elliptical waveguide connection between horn input and tower. See illustration on page 17. Also provides access for connection of transmission lines .... Type **349044-1**

Antenna and Radome Repair Kit. Material to repair small holes in the aluminum antenna body and holes or cuts up to 1-1/2 in (38 mm) long in the radome .... Type **48990**

Circular Waveguide Support System

The following antenna accessories are used to support the entire weight of the circular waveguide run at the mounting frame assembly of the horn-reflector antenna as illustrated on page 21. Refer to pages 196-201 for sliding restraints and WC281 and WC166 components.

Waveguide Support. Temperature compensated rods for hanging circular waveguide support plate from the antenna mount.

For use with 96 in (2438 mm) waveguide section between antenna and support plate .... Type **48976**

For use with 67 in (1448 mm) waveguide section between antenna and support (for antenna replacement use described below) .... Type **49887**

Support Plate. For use with Type 48976 or 49887 Waveguide Support.
WC281 .... Type **48605**
WC166 .... Type **49013**

Wilson Bolt Assembly. Set of 4. For use with above support plates .... Type **48606**

Replacement of KS-15676 Horn-Reflector Antenna

The SHX antenna may replace a KS-15676 antenna without relocation of the "milkstool" or other significant tower modifications. Because of dimensional differences between the two antennas, the following items are required:

1. The existing 8 ft section of WC281 waveguide between the antenna flange and the milkstool is replaced. For SHX10B1 use a 67 in (1448 mm) section, Type **47470-67**, which includes a swivel flange and hardware. For SHX10C1 use a WC281 to WC212 taper transition Type **49545** and a 49 inch (1245 mm) WC281 section, Type **49607-49** (total length 67 in (1448 mm)).

2. Specify waveguide support Type **49887**, which is used with the 67 in (1448 mm) section.

The existing support plate and Wilson bolt assembly can be reused.

High Wind Survival Antenna with four point fixing diamond mount and two-part epoxy finish for added corrosion protection.

Rural Fixed Cellular Subscriber Antenna Type 124520

Rural Fixed Cellular Subscriber Antenna Type 124519

Rural Fixed Cellular Base Station Antenna Type 124528-2

Nodal Antenna

Special Environment Antennas

High Wind Survival Antennas. Andrew's line of standard and shielded antennas can be supplied with a four-point fixing diamond mount which permits wind survival up to 150 mph (240 km/h) without the use of side struts. These antennas feature strong back structures providing excellent pointing accuracy in adverse operating conditions. Certain antennas are available for wind survival up to 200 mph (320 km/h). The antennas are manufactured at our factory in Great Britain. To order, contact your local Andrew Sales Office listed inside the back cover.

Antennas with heavy duty versions of standard mounts for survival under severe wind and ice conditions are also available from all locations.

Marine Environment Antennas. For marine and other corrosive environment applications, the added protection of a two-part epoxy paint finish is available as an option to provide excellent corrosion resistance. Also, planar radomes are available with all stainless steel hardware.

Rural Fixed Cellular

Andrew offers a line of base station and subscriber antennas for use in rural analog or digital cellular and multiaccess radio distribution systems. For additional information, contact your local Andrew Sales Office listed inside the back cover.

Nodal Antennas

Nodal Antennas are designed for the 10.5-10.7 GHz point-to-multipoint services. For further information on these antennas, ask for Bulletin 1325. LD( )-105 Series Antennas, for "subscriber" use, are described on page 74.

Rural Fixed Cellular – Base Station Antennas

Frequency GHz	Polarization	Type Number	Gain, dBi at 1.5 GHz	Input Power watts	Input Mates with	VSWR, max. (R.L., dB)
1.425-1.535	Vertical	**124528-1**	8	150	N Plug (male)	1.5 (14.0)
	Vertical	**124528-2**	11	150	N Plug (male)	1.5 (14.0)
1.425-1.535	Horizontal	**124527-1**	8	150	N Plug (male)	1.5 (14.0)
	Horizontal	**124527-2**	11	150	N Plug (male)	1.5 (14.0)

Rural Fixed Cellular – Subscriber Antennas

Frequency GHz	Type Number	Gain, dBi at 1.5 GHz	Input Power watts	Input Mates with	VSWR, max. (R. L., dB)
1.425-1.535	**124519**	14	100	N Plug (male)	1.5 (14.0)
	124520	20	100	N Plug (male)	1.5 (14.0)

Mechanical Characteristics for Rural Fixed Cellular Antennas

Antenna Type	Wind Survival Rating mph (km/h)	Windload at 100 mph (160 km/h) lb (N)	Weight lb (kg)	Mounting
Base Station Antennas				
124528-1	175 (280)	37 (165)	28 (13)	Bracket
124528-2	175 (280)	64 (285)	37 (17)	Bracket
124527-1	175 (280)	37 (165)	28 (13)	Bracket
124527-2	175 (280)	64 (285)	37 (17)	Bracket
Subscriber Antennas				
124519	162 (260)	79 (350)	11 (5)	2 in (50 mm) pipe
124520	162 (260)	90 (400)	15 (7)	2 in (50 mm) pipe

Nodal Antennas — Electrical Characteristics

Polarization	Type Number	Gain, dBi Minimum	Nominal Sector Coverage, Degrees	Front-to-Back Ratio	VSWR, max. (R.L., dB)
Vertical	**104140**	15.5	90	30	1.2 (20)
Horizontal	**104141**	15.5	90	30	1.2 (20)

Ordering Information for Microwave Antennas

Most of the standard microwave antennas and accessories presented on pages 58-80 are identified by a unique Andrew type number. Options are described below. When ordering, it is essential to properly specify the desired options.

Planar Radomes. All shielded antennas, except where TEGLAR® is specified in the ordering tables, include a standard Hypalon-coated nylon planar radome. The TEGLAR long-life radome is available at extra cost. To order the TEGLAR radome, specify *"TEGLAR Radome"*. For many antennas, the TEGLAR radome is standard, as described in the tables, and need not be specified.

One-Piece and Two-Piece Reflectors. Antennas are supplied with one-piece reflectors or with two- or four-piece reflectors split through the center and bolted together at the site. The standard and optional reflectors are identified on page 53. To order optional reflectors, specify *"two-piece"* or *"four-piece"*. Where two-piece construction is standard, it is not necessary to specify.

Optional Mounts. All parabolic antennas (except UMX-459 Series) include a vertical tower mount. The special-purpose mounts described on page 87 are optional at extra cost. To order, specify *"Antenna less standard mount"* and the Type Number of the optional mount. For example: "Type PL10-65D less standard mount; with Type VT10 mount." Refer to page 86 for information on mounts included with the antennas.

Antenna and Radome Color. Standard and optional antenna and radome colors are discussed on page 53. The standard antenna and radome color will be supplied unless an optional color is specified. To order optional antenna or plastic radome colors, specify *"aviation white"* or *"aviation orange"*.

Packing. All antennas, radomes and mounts are supplied with standard pack. Export pack, which includes barrier bag sealing of feeds and plywood sheathing of entire antenna crate, is available at extra cost. To order, specify *"Export Pack"*.

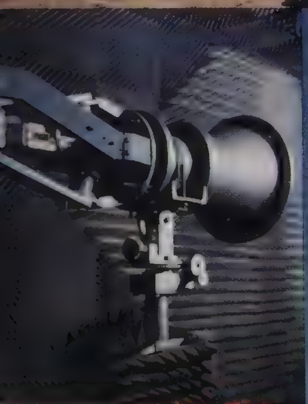
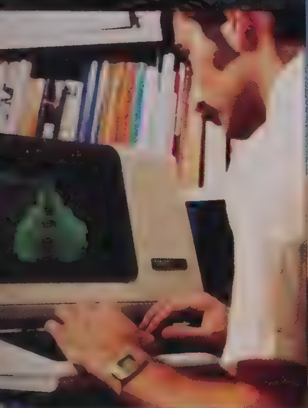
Andrew Corporation features a complete line of superior quality, high performance earth station antennas. Advanced Gregorian dual-reflector and patented* prime focus antenna designs combined with precision manufacturing techniques and complete far-field range testing programs make Andrew a worldwide industry leader in earth station antenna design and manufacture. Andrew earth station antennas operating at Ka, Ku and C frequency bands are in use throughout the world.

The rapid growth of satellite communication networks for both business and entertainment applications has necessitated closer satellite positioning within the designated geostationary orbital arc. To accommodate the closer spacing of satellites, responsible agencies such as the FCC, INTELSAT, EUTELSAT, the CCIR, the Australian DOC, Canadian DOC and others have implemented extremely stringent earth station antenna pattern specifications. Andrew earth station antennas meet or exceed these rigid radiation pattern requirements.

For many years, Andrew has been developing and refining the design techniques utilized for both Gregorian dual-reflector and prime focus feed systems. Mathematical expressions for near-field radiation patterns from feed horns and their subsequent redistribution from Gregorian subreflectors and specially shaped main reflectors enable Andrew to design earth station antennas with extremely high efficiency and closely controlled radiation pattern envelopes. These computer aided design techniques enable Andrew engineers to evaluate the effects of various reflector contours and accurately predict the electrical performance results prior to antenna panel fabrication. Each Andrew earth station antenna type is fully range tested to verify theoretical electrical performance characteristics. Andrew performs far-field 360° pattern range tests of directive gain, cross polarization, VSWR and side lobe measurements at multiple frequencies across the entire operational frequency band. This proven performance is part of Andrew's tradition of high quality, superior performance earth station antenna design. Antenna feed horns are thoroughly tested in an anechoic chamber to determine radiation pattern characteristics in all planes. These various testing techniques confirm computer-predicted performance and provide technical feedback for further engineering development. Previously determined theoretical calculations are verified while electrical performance characteristics are optimized to ensure superior antenna performance during actual operating conditions.

During the last two years, Andrew has developed earth station antenna systems for satellite distribution networks operating at the Ka-, Ku- and C-band frequencies. These extensive developments include; 4.2-metre Ka-band antennas for rapidly developing data and voice distribution networks; 8-, 6.8-, 5.6-, 4.6-, 3.7-, 3-, 2.4- and 1.8-metre Ku-band antennas (KSAT); 1.8-metre Very Small Aperture Terminal (VSAT); 1.8- and 1.5-metre TVRO Ku-band antennas; 2.3-metre satellite news gathering Ku-band antennas; and cost effective 12-, 9.1-, 7.3- and 4.5-metre C-band antennas in support of the data, voice and broadcast industry networks.




Andrew continues to maintain the highest quality control standards in the manufacture of all earth station antennas. Precision stretch-formed reflector panels are held to extremely close tolerances. Prior to assembly on the main reflector, each reflector panel is fully tested on precision fixtures. Reflectors are manufactured by precision spinning or stretch forming techniques which ensure highly accurate surface contours. Andrew's commitment to quality control ensures that each antenna is manufactured to the highest possible standards.

Andrew earth station antenna mounts are fabricated from hot-dipped galvanized steel to ensure durability and maintain reliability. Hot-dipped galvanized steel mount assemblies provide the rigidity required to maintain antenna pointing accuracy under extreme climatic conditions and ensure continuous system operation. Use of high tensile strength hardware in friction-type connections prevents structural movement and eliminates the need for future retightening.

Years of experience in the design and development of earth station antennas has maintained Andrew's position as a world leader of earth station antenna systems. A wide variety of optional equipment and services are offered from Andrew to enhance the operational capabilities of each earth station antenna system. Refer to the specific earth station type in this catalog for a complete listing of guaranteed performance specifications and optional equipment. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

*Patented United States 3,553,707; Canada 873,547; United Kingdom 1,199,266; Australia 417,525.

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "B" ("A" where applicable) and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Motorized Mount**
  Precision Antenna Positioning
- **Galvanized Ground Mount and Back Structure Assemblies**
  Maximum Durability with Minimal Maintenance

Andrew's 12-metre earth station antennas are optimized for the increased traffic volume and high performance requirements of INTELSAT operators, common carriers and PTT's. These extremely high performance antennas are currently utilized for a wide variety of applications in countries throughout the world.

Each independently supported aluminum reflector panel segment is precision stretch-formed and individually adjustable to optimize panel alignment. Use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Electrically operated motor drive systems are included as part of the standard earth station system package with a wide range of operating voltages for various world-wide applications. The motorized elevation-over-azimuth mount assembly enables horizon-to-horizon coverage from virtually any world-wide location.

Andrew supports a variety of optional equipment and services to further enhance the operational capabilities of the 12-metre earth station antenna system. Available equipment options include 4-port linear or circularly polarized combining networks and corresponding support systems, step track or programmable tracking control systems, equipment enclosures, feed rotation systems, maintenance platforms, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Type Number	ESA120-4A	ESA120-46A	ESA120-4CPA	ESA120-46CWA*
Electrical Specifications				
Operating Frequency, GHz				
Receive	3.7-4.2	3.7-4.2	3.7-4.2	3.625-4.2
Transmit	—	5.925-6.425	—	5.850-6.425
Gain, Steady State, Mid-band, ±0.2 dBi				
Receive	53.1	53.1	53.1	53.0
Transmit	—	56.4	—	56.3
Polarization	Linear	Linear	Circular	Circular
VSWR, Maximum: Receive (Transmit)	1.25 (—)	1.25 (1.20)	1.25 (—)	1.30 (1.25)
Beamwidth, Mid-band, Degrees				
−3 dB Receive (Transmit)	0.37 (—)	0.37 (0.24)	0.37 (—)	0.37 (0.24)
−15 dB Receive (Transmit)	0.75 (—)	0.75 (0.48)	0.75 (—)	0.75 (0.48)
Antenna Noise Temperature at Feed Interface, ±2K				
10° Elevation	29	29	32	38
30° Elevation	20	20	23	29
50° Elevation	18	18	21	27
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580			
Tx Power Handling Capability, kW (per port)	—	5	—	5
Feed Interface Flanges mate with, Receive (Transmit)	CPR229G (—)	CPR229G (CPR137G)	CPR229G (—)	CPR229G (CPR137G)
Isolation, Tx into Rx, dB	—	40	—	85
Cross-Polarization Discrimination, dB, on axis	35	35	—	—
Axial Ratio	—	—	1.06	1.06

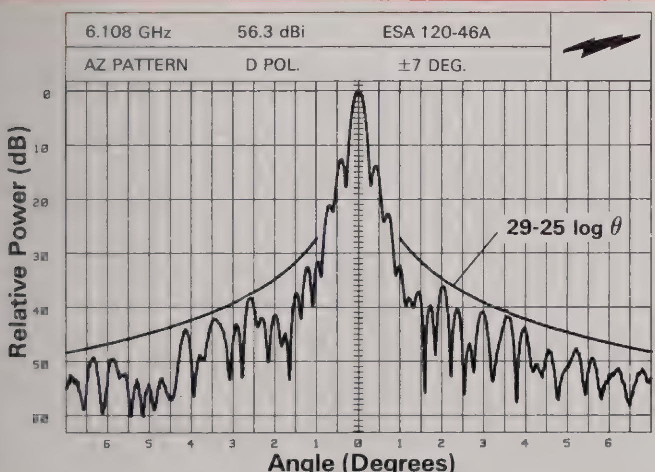
*Including 4-port network

Mechanical Specifications

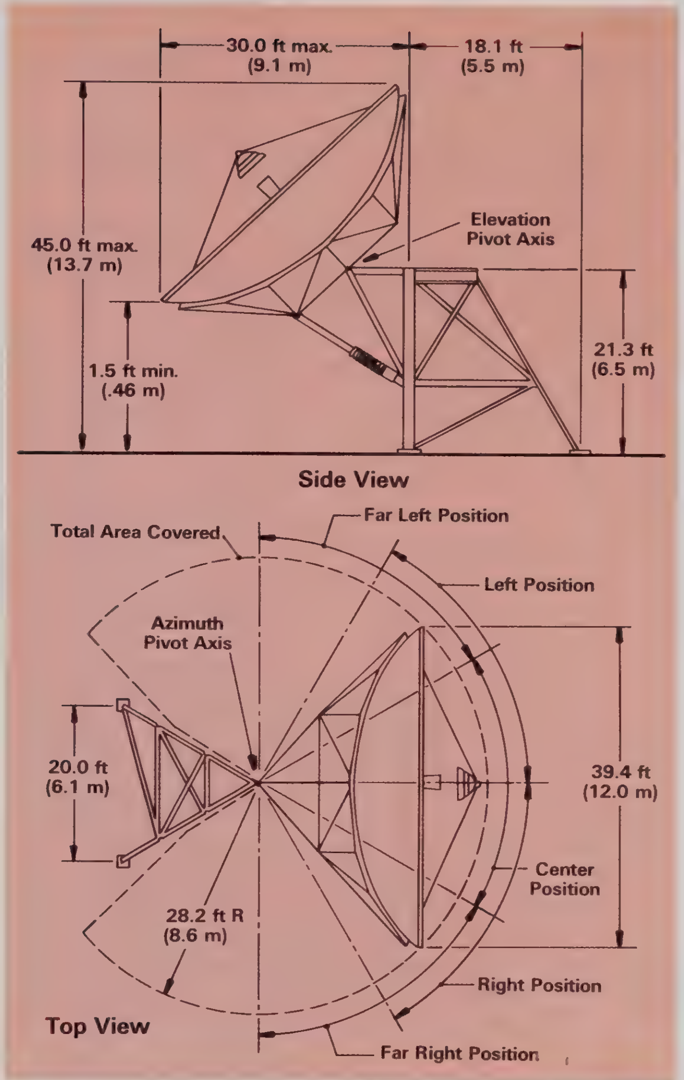
Antenna Diameter	12m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	12 segment-floating
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (46°)
Azimuth	180° (60°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Single-Speed Power	208VAC; 3 phase; 60 Hz 240VAC; 1 phase; 50 Hz
Elevation	0.01°/sec
Azimuth	0.01°/sec
Weight, Net	26000 lb (11800 kg)
Shipping (Typical)	30000 lb (13600 kg)
Volume, Shipping (Typical)	3500 ft^3 (99 m^3)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Hot-dipped galvanized steel
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure (optional)	
Diameter (hexagonal)	80 in (2032 mm)
Depth	42 in (1067 mm)

Foundation Specifications (Typical)

Type	Slab	Pier
Size		
Width	23 ft (7 m)	4.5 ft (1.4 m)
Depth	2 ft (.6 m)	15 ft (4.6 m)
Length	26 ft (8 m)	—
Concrete		
Volume	44 yd^3 (34 m^3)	33 yd^3 (25 m^3)
Compressive Strength	3000 lb/in^2 (211 kg/cm^2)	3000 lb/in^2 (211 kg/cm^2)
Soil Bearing Capacity	4000 lb/ft^2 (19528 kg/m^2)	4000 lb/ft^2 (19528 kg/m^2)
Conduit (PVC)		
Electrical	2 in (51 mm)	
IFL	4 in (102 mm)	



Actual satellite pattern measured upon completion of Andrew installation/alignment



Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Optional	150 mph (241 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 45 mph (72 km/h) with 1/4 in (6 mm) of radial ice
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.023° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Earth Station Antennas
9.1-Metre

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "B/D-2/F-3" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Galvanized Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
- **Large Equipment Enclosure**
- **Optional Single or Dual Speed Motorized Mount**

The Andrew 9.1-metre earth station antenna is designed to address the requirements of the television broadcast industry and other telecommunication system operators demanding unsurpassed flexibility and electrical performance in a single cost effective package.

The computer optimized Gregorian dual-reflector system, together with precision stretch-formed reflector panel segments using close-tolerance manufacturing techniques, results in exceptionally high gain, superior efficiency and closely controlled pattern characteristics. All aluminum reflector panels and trusses are independently adjustable to ensure precise panel alignment. The effects of differential expansion are therefore minimized to provide consistent performance throughout the operating temperature range. A large equipment enclosure is integrated into the antenna back structure assembly which easily accommodates optional 4-port combining networks with corresponding support systems.

The hot-dipped galvanized steel ground mount assembly ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The elevation-over-azimuth mount enables horizon-to-horizon coverage from any world-wide location.

A variety of optional equipment and services are offered from Andrew to further enhance the operational capabilities of the 9.1-metre earth station antenna system. Available equipment options include 2-, 3-, or 4-port linear or circularly polarized combining networks, programmable control systems, feed rotation systems, maintenance platforms, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Type Number	ESA91-4A	ESA91-46A	ESA91-4CPA	ESA91-46CWA*
Electrical Specifications				
Operating Frequency, GHz				
Receive	3.7-4.2	3.7-4.2	3.7-4.2	3.625-4.2
Transmit	—	5.925-6.425	—	5.850-6.425
Gain, Steady State, Mid-band, ±0.2 dBi				
Receive	50.4	50.4	50.4	50.3
Transmit	—	53.9	—	53.8
Polarization	Linear	Linear	Circular	Circular
VSWR, Maximum: Receive (Transmit)	1.30 (—)	1.30 (1.25)	1.30 (—)	1.30 (1.25)
Beamwidth, Mid-band, Degrees				
−3 dB Receive (Transmit)	0.51 (—)	0.51 (0.32)	0.51 (—)	0.51 (0.32)
−15 dB Receive (Transmit)	1.00 (—)	1.00 (0.62)	1.00 (—)	1.00 (0.62)
Antenna Noise Temperature at Feed Interface, ±2K				
10° Elevation	30	30	33	39
30° Elevation	19	19	22	28
50° Elevation	17	17	20	26
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580			
Tx Power Handling Capability, kW (per port)	—	5	—	5
Feed Interface Flanges mate with, Receive (Transmit)	CPR229G (—)	CPR229G (CPR137G)	CPR229G (—)	CPR229G (CPR137G)
Isolation, Tx into Rx, dB	—	40	—	40
Cross-Polarization Discrimination, dB, on axis	35	35	—	—
Axial Ratio	—	—	1.06	1.06

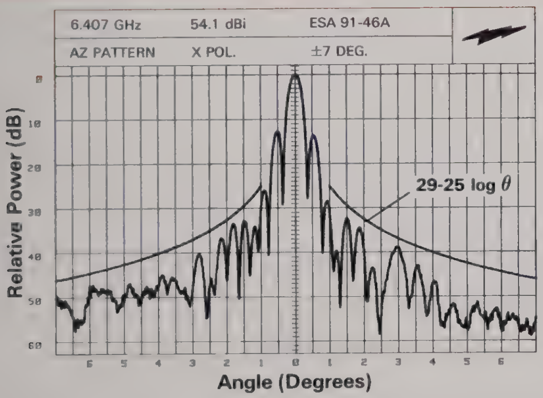
*Including 4-port network

Mechanical Specifications

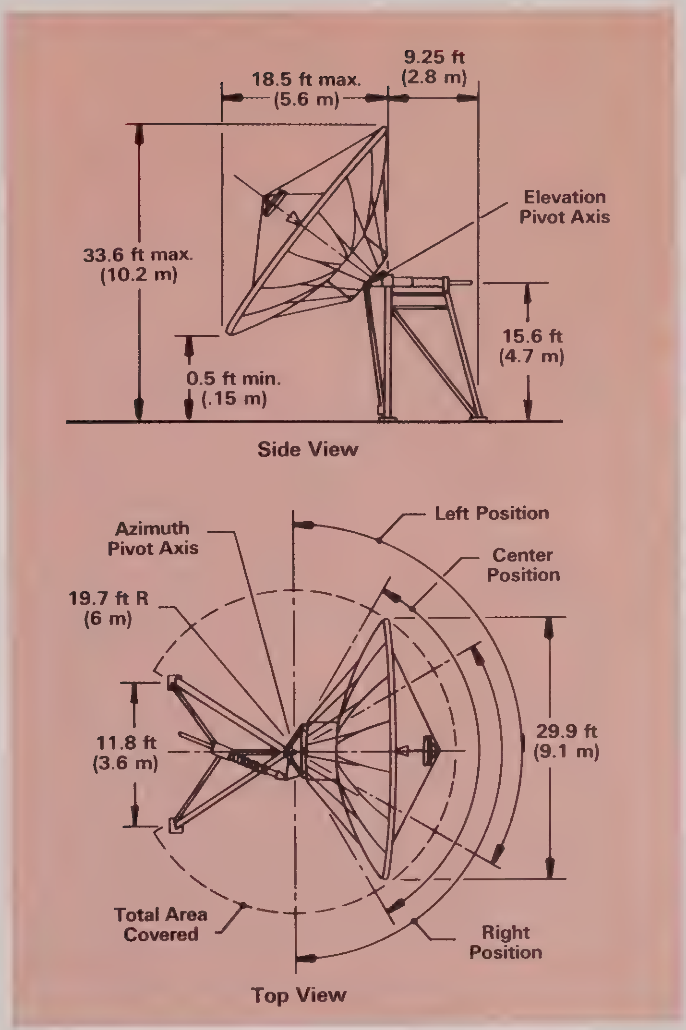
Antenna Diameter	9.1 m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 20 Panel Segment Circumferential Shell Design
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Single-Speed Power	380VAC; 3 phase; 50 Hz
Elevation	0.01°/sec
Azimuth	0.01°/sec
Polarization	—
Dual-Speed Power	208VAC; 3 phase; 60 Hz
Elevation, low (high)	0.2°/sec (2°/sec)
Azimuth, low (high)	0.2°/sec (2°/sec)
Polarization	2.5°/sec
Weight, Net	8000 lb (3629 kg)
Shipping (Typical)	10,300 lb (4672 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure	
Diameter	78 in (1981 mm)
Depth	42 in (1067 mm)

Foundation Specifications (Typical)

Type	Slab	Pier
Size		
Width	18.75 ft (5.7 m)	5 ft (1.5 m)
Depth	2 ft (.6 m)	20.5 ft (6.2 m)
Length	18.75 ft (5.7 m)	—
Concrete		
Volume	26 yd^3 (19.9 m^3)	19.3 yd^3 (14.7 m^3)
Compressive Strength	3000 lb/in^2 (211 kg/cm^2)	3000 lb/in^2 (211 kg/cm^2)
Reinforcing Steel	2840 lb (1288 kg)	2400 lb (1089 kg)
Soil Bearing Capacity	4000 lb/ft^2 (19528 kg/m^2)	3000 lb/ft^2 (14646 kg/m^2)
Conduit (PVC)		
Electrical	2 in (51 mm)	
IFL	4 in (102 mm)	



Actual satellite pattern measured upon completion of Andrew installation/alignment



Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	−40° to 125°F (−40° to 52°C)
Pointing Accuracy 30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.034° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Earth Station Antennas
7.3-Metre

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "D-1/F-2" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Galvanized Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
- **Large Equipment Enclosure**
- **Optional Single or Dual Speed Motorized Mount**

The 7.3-metre earth station antenna provides superior pattern performance and antenna versatility required by television broadcasters and telecommunication system operators.

The precisely formed dual-reflector Gregorian system, coupled with close-tolerance reflector panel manufacturing techniques, results in extremely accurate surface contours, providing superior electrical performance characteristics verified by radiation patterns taken from 360° far-field range testing and satellite measurements. All aluminum reflector panels are manufactured to ensure precise panel alignment. The effects of differential expansion are therefore minimized providing consistent performance throughout the operating temperature range. Integrated into the antenna back structure assembly is a large equipment enclosure capable of housing optional 4-port combining networks with associated support systems.

The mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The elevation-over-azimuth mount enables horizon-to-horizon coverage from any world-wide location.

Optional equipment and services are offered from Andrew to further enhance the operational capabilities of the 7.3-metre earth station antenna system. Available equipment options include 2-, 3-, or 4-port linear or circularly polarized combining networks, programmable control systems, feed rotation systems, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Type Number	ESA73-4A	ESA73-46A	ESA73-4CPA	ESA73-46CWA*
Electrical Specifications				
Operating Frequency, GHz				
Receive	3.7-4.2	3.7-4.2	3.7-4.2	3.625-4.2
Transmit	—	5.925-6.425	—	5.850-6.425
Gain, Steady State, Mid-band, ±0.2 dBi				
Receive	48.5	48.5	48.5	48.4
Transmit	—	51.7	—	51.6
Polarization	Linear	Linear	Circular	Circular
VSWR, Maximum: Receive (Transmit)	1.30 (—)	1.30 (1.25)	1.30 (—)	1.30 (1.25)
Beamwidth, Mid-band, Degrees				
–3 dB Receive (Transmit)	0.64 (—)	0.64 (0.44)	0.64 (—)	0.64 (0.44)
–15 dB Receive (Transmit)	1.30 (—)	1.30 (0.83)	1.30 (—)	1.30 (0.83)
Antenna Noise Temperature at Feed Interface, ±2K				
10° Elevation	30	30	33	39
30° Elevation	19	19	22	28
50° Elevation	17	17	20	26
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580			
Tx Power Handling Capability, kW (per port)	—	5	—	5
Feed Interface Flanges mate with, Receive (Transmit)	CPR229G (—)	CPR229G (CPR137G)	CPR229G (—)	CPR229G (CPR137G)
Isolation, Tx into Rx, dB	—	40	—	40
Cross-Polarization Discrimination, dB, on axis	35	35	—	—
Axial Ratio	—	—	1.06	1.06

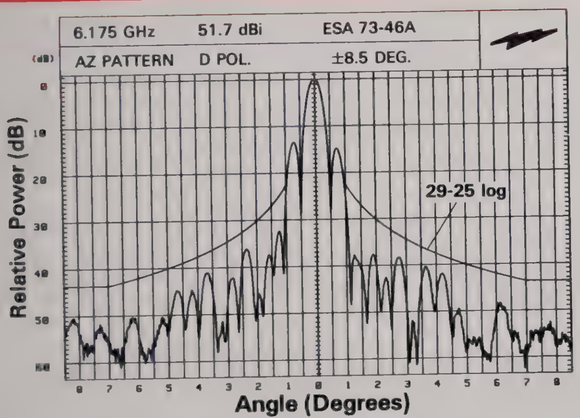
*Including 4-port network

Mechanical Specifications

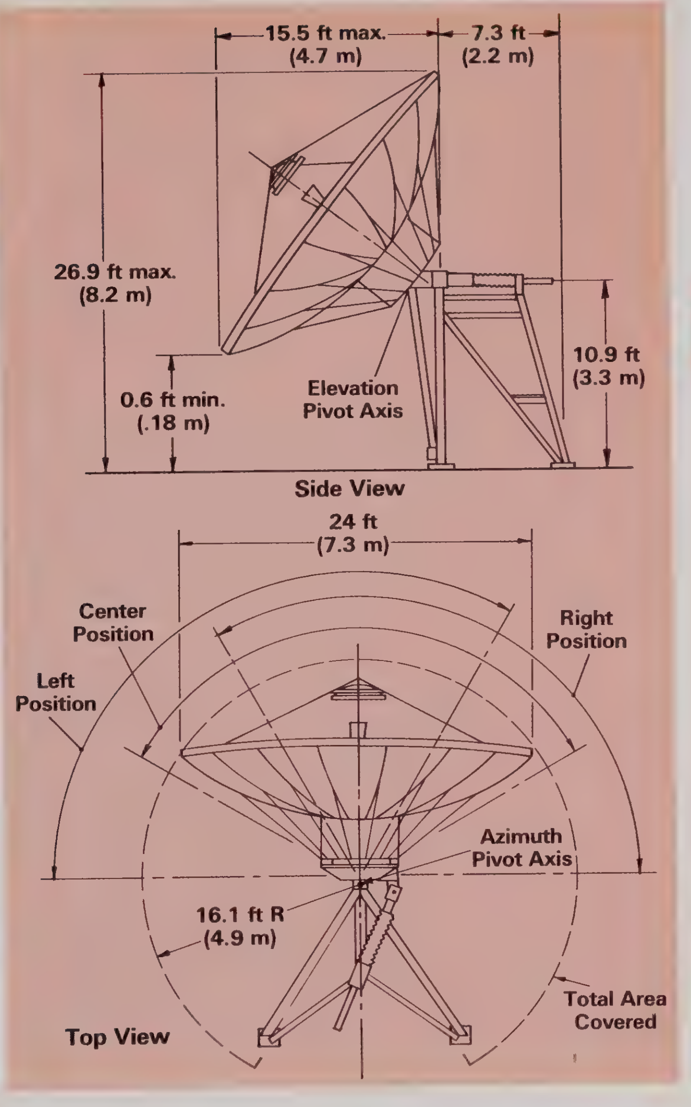
Antenna Diameter	7.3m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 16 Panel Segment Circumferential Shell Design
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Single-Speed Power	380VAC; 3 phase; 50 Hz
Elevation	0.01°/sec
Azimuth	0.01°/sec
Dual-Speed Power	208VAC; 3 phase; 60 Hz
Elevation, low (high)	0.50°/sec (2°/sec)
Azimuth, low (high)	0.50°/sec (2°/sec)
Polarization	2.5°/sec
Weight, Net	6500 lb (2948 kg)
Shipping (Typical)	8200 lb (3720 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure	
Diameter	48 in (1219 mm)
Depth	46 in (1168 mm)

Foundation Specifications (Typical)

Type	Slab	Pier
Size		
Width	15 ft (4.6 m)	2.5 ft (.76 m)
Depth	1.5 ft (.46 m)	18 ft (5.5 m)
Length	15 ft (4.6 m)	—
Concrete		
Volume	12.5 yd^3 (9.6 m^3)	10 yd^3 (7.6 m^3)
Compressive Strength	3000 lb/in^2 (211 kg/cm^2)	3000 lb/in^2 (211 kg/cm^2)
Reinforcing Steel	1308 lb (593 kg)	742 lb (337 kg)
Soil Bearing Capacity	4000 lb/ft^2 (19528 kg/m^2)	4000 lb/ft^2 (19528 kg/m^2)
Conduit (PVC)		
Electrical	2 in (51 mm)	
IFL	4 in (102 mm)	



Actual satellite pattern measured upon completion of Andrew installation/alignment



Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy 30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.031° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds CCIR 580 Requirements
- **Prime Focus Feed System**
  Exceptionally High Gain
  Superior Pattern Characteristics
- **Galvanized Pedestal Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance

The new 4.5-metre earth station antenna series from Andrew incorporate performance and operational characteristics particularly suited for high-density data and voice communication networks as well as various broadcast industry applications. These high performance antennas are offered in transmit/receive as well as receive-only configurations and are utilized for a wide variety of applications in countries throughout the world.

Andrew's exclusively designed prime focus, beam-shaping feed and ground plane configuration, together with a precision spun aluminum reflector, produce extremely high gain, excellent efficiency and closely controlled pattern characteristics. The segmented aluminum reflector minimizes shipping costs. All required installation mounting holes are pre-drilled before the reflector spinning is segmented to ensure the assembled reflector will maintain the original surface contour.

The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from any worldwide location. The easily installed pedestal mount permits non-critical foundation orientation. The hot-dipped galvanized steel structure ensures extended product life while use of galvanized and stainless steel hardware maximizes corrosion resistance.

Various available equipment options include 3-port combining network configurations, motorized TVRO programmable control systems, anti-icing equipment and pressurization systems.

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

Type Number	ESA45-4A	ESA45-46B
Electrical Specifications		
Operating Frequency, GHz Receive Transmit	 3.7-4.2 —	 3.7-4.2 5.925-6.425
Gain, Steady State, Mid-band, ±0.2 dBi Receive Transmit	 44.2 —	 43.9 46.6
Polarization VSWR, Maximum: Receive (Transmit)	Linear 1.30 (—)	Linear 1.30 (1.25)
Beamwidth, Mid-band, Degrees –3 dB Receive (Transmit) –15 dB Receive (Transmit)	 1.20 (—) 2.40 (—)	 1.20 (0.85) 2.40 (1.90)
Antenna Noise Temperature at Feed Interface, ±2K 10° Elevation 30° Elevation 50° Elevation	 32 20 19	 32 20 19
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580	
Tx Power Handling Capability, kW (per port) Feed Interface Flanges mate with, Receive (Transmit) Isolation, Tx into Rx, dB Cross-Polarization Discrimination, dB, on axis	— CPR229G (—) — 30	5 CPR229G (CPR137G) 40 30

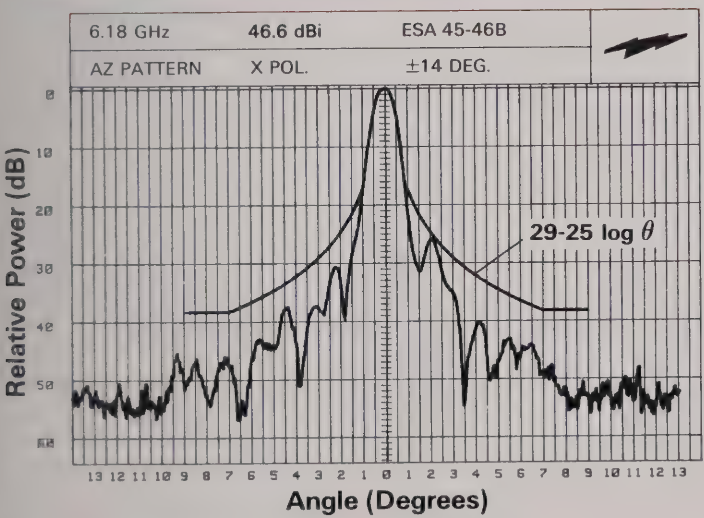
Mechanical Specifications

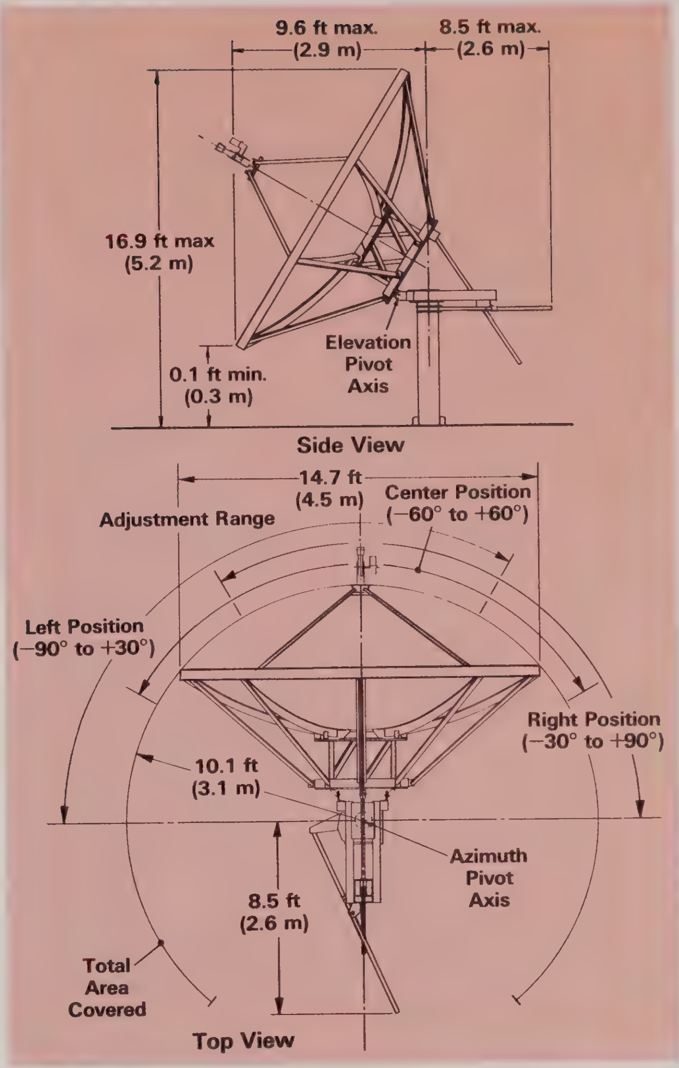
Antenna Diameter	4.5m
Antenna Type	Prime Focus
Mount Type	EL over AZ
Reflector Construction	Aluminum 6 Panel Segments
Antenna Pointing Range*: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates**	
Single-Speed Power	208VAC; 3 phase; 60 Hz
Elevation	0.40°/sec
Azimuth	0.40°/sec
Polarization	2.5°/sec
Weight, Net	2400 lb (1089 kg)
Shipping (Typical)	3000 lb (1361 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel

*Manual mount includes hand crank for 15° continuous azimuth/elevation fine adjustment.
**Dual speed system available upon request.

Foundation Specifications (Typical)

Type	Slab
Size	
Width	10 ft (3 m)
Depth	1.5 ft (.5 m)
Length	10 ft (3 m)
Concrete	
Volume	5.5 yd³ (4.2 m³)
Compressive Strength	3000 lb/in² (211 kg/cm²)
Reinforcing Steel	285 lb (129 kg)
Soil Bearing Capacity	3000 lb/ft² (14646 kg/m²)
Conduit (PVC)	
Electrical	2 in (51 mm)
IFL	4 in (102 mm)





Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.035° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft² (1135 watts/m²)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Actual satellite pattern measured upon completion of Andrew installation/alignment

Features:

- **Superior Performance**
  Meets or Exceeds INTELSAT "E-3" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Motorized Mount**
- **Galvanized Mount and Back Structure**
  Maximum Durability with Minimal Maintenance

The Andrew 8-metre earth station antenna is optimized for exceptionally high gain and excellent radiation pattern characteristics. Advanced dual-reflector technology and precision reflector panel shaping assure electrical performance specifications.

The computer optimized Gregorian dual-reflector system, together with precision stretch-formed reflector panel segments, results in extremely high gain, superior efficiency and controlled pattern characteristics.

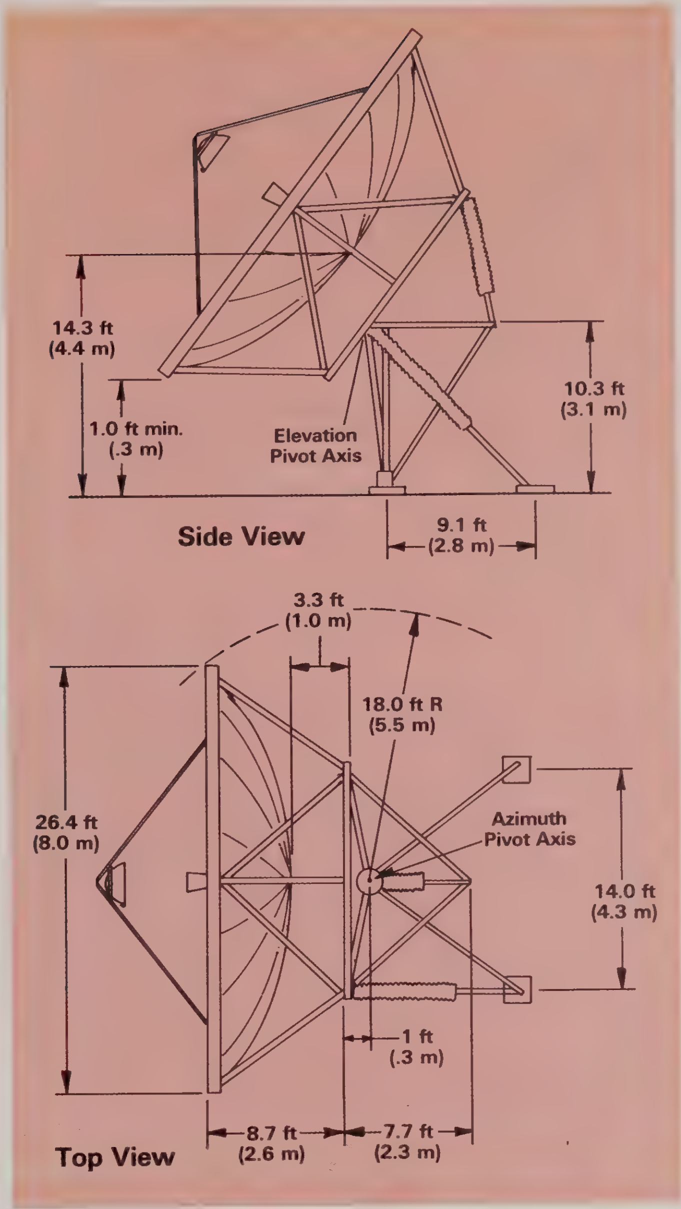
The independently supported aluminum reflector panels are field adjustable to ensure precise panel alignment and shaped to exacting tolerances for extremely accurate surface contour to maximize the electrical performance characteristics.

Electrically operated motor drive systems are included as part of the standard earth station system package. The motorized elevation-over-azimuth mount features manual or auto-tracking capability.

The mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Available equipment options include 4-port linearly polarized combining networks, step track or programmable tracking control systems, equipment enclosures, feed rotation systems, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

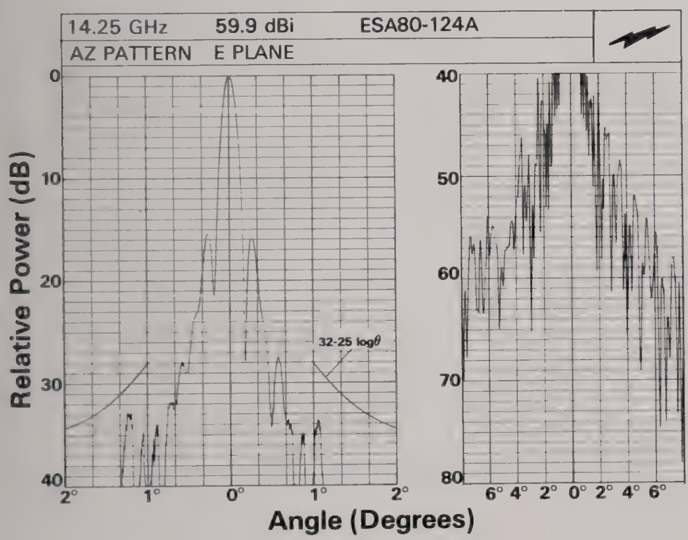
Type Number	ESA80-114A	ESA80-124A	ESA80-134A
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	57.9	58.5	58.8
Transmit	59.9	59.9	59.9
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
–3 dB Receive (Transmit)	0.20 (0.16)	0.19 (0.16)	0.18 (0.16)
–15 dB Receive (Transmit)	0.41 (0.32)	0.38 (0.32)	0.35 (0.32)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	64	64	64
30° Elevation	50	50	50
50° Elevation	48	48	48
Radiation Pattern Performance	Per INTELSAT "E-3" Requirements and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	30	30	30



Mechanical Specifications

Antenna Diameter	8m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 12 Panel Segments
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-70° (15°)
Azimuth	60° (25°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Single-Speed Power	208VAC; 3 phase; 60 Hz 220VAC, 1 phase, 50 Hz
Elevation	0.01°/sec
Azimuth	0.01°/sec
Weight, Net	11000 lb (4990 kg)
Shipping (Typical)	14000 lb (6350 kg)
Material/Finish	
Main Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Hot-dipped galvanized steel
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.



Actual range pattern

Environmental Specifications

Wind Loading	
Survival (steady state)	150 mph (240 km/h) without ice 100 mph (161 km/h) with 2 in (51 mm) of radial ice
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 45 mph (72 km/h) with 1/4 in (6 mm) of radial ice
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy 30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.06° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)

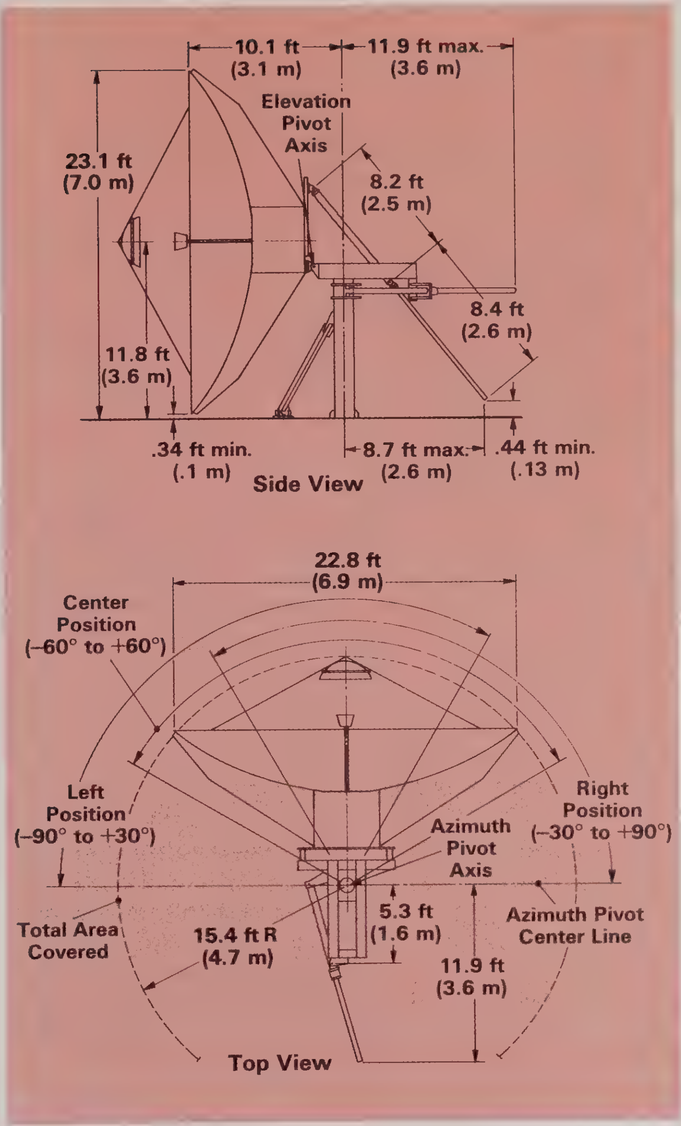
Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Galvanized Pedestal Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
- **Large Equipment Enclosure**
- **Optional Motorized Drives**
  Precision Three Axes Antenna Positioning

Andrew Corporation's 6.8-metre earth station antennas provide the exceptional pattern characteristics and versatile operational capabilities required by corporate telecommunication data/voice distribution networks and the television broadcast industry. Advanced dual-reflector technology and precision reflector panel shaping ensure unequalled electrical performance. These exceptionally high performance antennas are currently in use throughout the world for a wide variety of telecommunication applications.

The segmented aluminum reflector panels are independently adjustable to ensure precise panel alignment providing consistent performance throughout the specified operating temperature range. The antenna back structure assembly includes a large equipment enclosure capable of housing optional 4-port combining networks and associated support systems.

Type Number	ESA68-114	ESA68-124	ESA68-134
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	56.6	57.0	57.4
Transmit	58.4	58.4	58.4
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
–3 dB Receive (Transmit)	0.23 (0.19)	0.22 (0.19)	0.21 (0.19)
–15 dB Receive (Transmit)	0.44 (0.38)	0.43 (0.38)	0.42 (0.38)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	65	65	65
30° Elevation	50	50	50
50° Elevation	45	45	45
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	35	35	35



Mechanical Specifications

Antenna Diameter	6.8m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 16 Panel Segment Circumferential Shell Design
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Dual-Speed	
Elevation, low (high)	0.02°/sec (0.08°/sec)
Azimuth, low (high)	0.02°/sec (0.08°/sec)
Polarization	0.25°/sec
Weight, Net	5000 lb (2268 kg)
Shipping (Typical)	6400 lb (2903 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure	
Diameter	48 in (1219 mm)
Depth	30 in (762 mm)

The elevation-over-azimuth pedestal mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The ground mount is capable of horizon-to-horizon coverage from any worldwide location.

Available equipment options include 2- or 4-port linearly polarized combining networks, programmable control systems, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Service.

Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	−40° to 125°F (−40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.020° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "E-2" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain and Efficiency
- **Galvanized Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
  Non-Critical Foundation Orientation
- **Large Equipment Enclosure**
- **Optional Motorized Mount**

The Andrew 5.6-metre earth station antennas are designed to accommodate high volume data and audio telecommunication system requirements as well as video distribution systems for the television broadcast industry.

The segmented aluminum reflector panels and truss structure are independently field adjustable to optimize precise panel alignment and shaped to exacting tolerances for extremely accurate surface contour to maximize the electrical performance characteristics. A large equipment enclosure is integrated into the antenna back structure assembly capable of accommodating optional 4-port combining networks and associated support systems.

The elevation-over-azimuth mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The ground mount allows for non-critical foundation orientation and is capable of horizon-to-horizon coverage from any world-wide location.

Available equipment options include 2- or 4-port linearly polarized combining networks and corresponding support systems, motorized drive systems with a wide range of operating voltages, programmable control systems, feed rotation systems, anti-icing equipment, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

Type Number	ESA56-114B	ESA56-124B	ESA56-134B
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	55.1	55.5	56.0
Transmit	57.0	57.0	57.0
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
–3 dB Receive (Transmit)	0.30 (0.23)	0.28 (0.23)	0.26 (0.23)
–15 dB Receive (Transmit)	0.56 (0.44)	0.52 (0.44)	0.51 (0.44)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	57	57	57
30° Elevation	47	47	47
50° Elevation	44	44	44
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	35	35	35

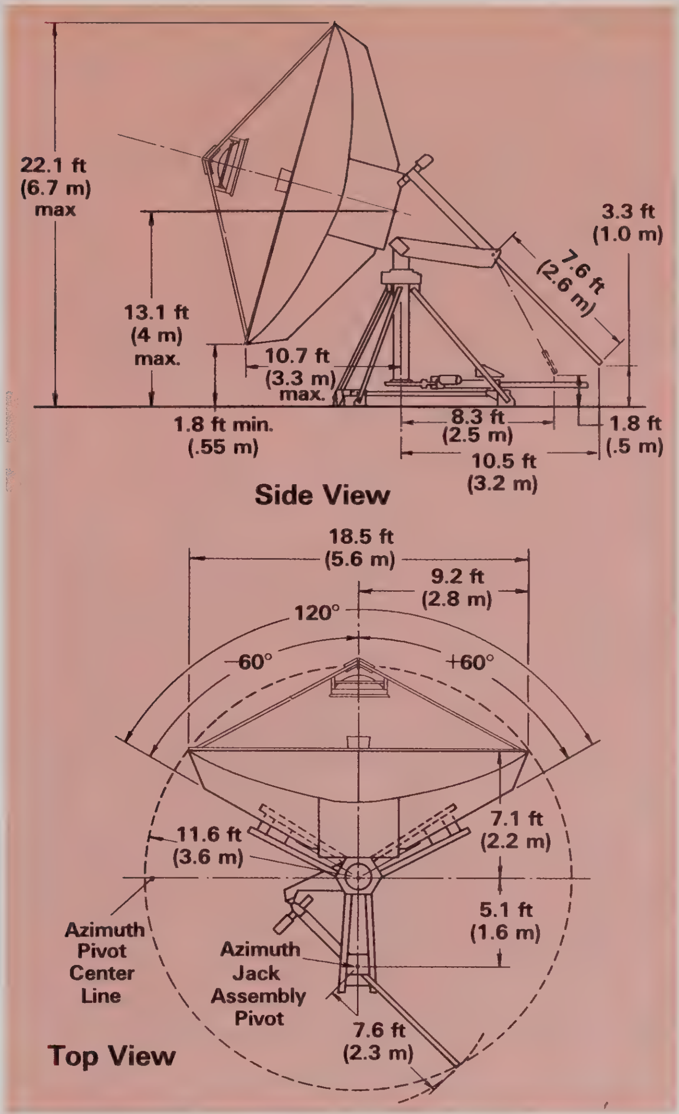
Mechanical Specifications

Antenna Diameter	5.6m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 16 Panel Segment Circumferential Shell Design
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	360° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates*	
Single-Speed Power	208VAC; 3 phase; 60 Hz
Elevation	0.10°/sec
Azimuth	0.10°/sec
Polarization	2.5°/sec
Dual-Speed Power	240VAC; 1 phase; 50 Hz
Elevation, low (high)	0.01°/sec (0.04°/sec)
Azimuth, low (high)	0.01°/sec (0.04°/sec)
Polarization	2.5°/sec
Weight, Net	3300 lb (1497 kg)
Shipping (Typical)	4700 lb (2132 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount/Hardware	Hot-dipped galvanized and stainless steel
Enclosure	
Diameter	48 in (1219 mm)
Depth	30 in (762 mm)

*Other drive systems available upon request.

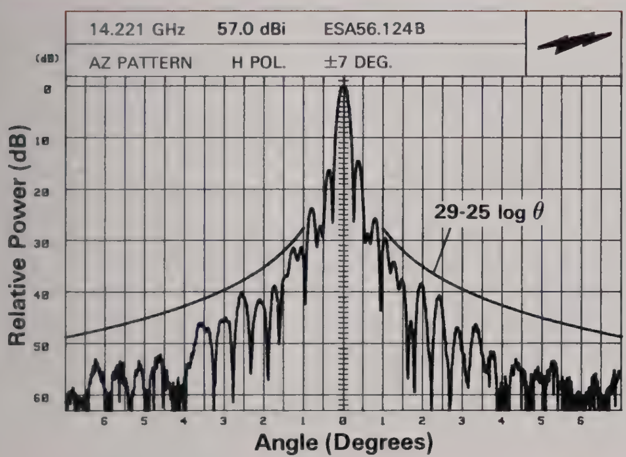
Foundation Specifications (Typical)

Type	Slab
Size	
Width	15 ft (4.6 m)
Depth	2.33 ft (.71 m)
Length	15 ft (4.6 m)
Concrete	
Volume	19.4 yd^3 (14.8 m^3)
Compressive Strength	3000 lb/in^2 (211 kg/cm^2)
Reinforcing Steel	1210 lb (549 kg)
Soil Bearing Capacity	1600 lb/ft^2 (7811 kg/m^2)
Conduit (PVC)	
Electrical	2 in (51 mm)
IFL	4 in (102 mm)



Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	−40° to 125°F (−40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.026° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.



Actual satellite pattern measured upon completion of Andrew installation/alignment

Earth Station Antennas
4.6-Metre

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "E-1" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Superior Pattern Characteristics
- **Galvanized Pedestal Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
- **Large Equipment Enclosure**
- **Optional Motorized Mount**
  Dual-Speed Precision Antenna Positioning

The new 4.6-metre earth station antennas from Andrew incorporate performance and operational characteristics particularly suited for high-density data and voice telecommunication networks as well as various broadcast industry applications.

The uniquely formed dual-reflector Gregorian system, coupled with close-tolerance manufacturing techniques, results in extremely accurate surface contours, providing superior electrical performance characteristics. The segmented aluminum reflector panels are precisely cut from a single piece, precision spun reflector to minimize shipping costs. Integrated into the aluminum back structure assembly is a large equipment enclosure capable of housing optional 4-port combining networks with corresponding support systems.

The hot-dipped galvanized steel ground mount assembly ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from virtually any world-wide location. The easily installed pedestal mount allows for non-critical foundation orientation and is capable of 180° of azimuth travel via three 120° continuous ranges with 30° overlap. Elevation travel is continuous from 0 to 90°.

Available equipment options include 2- and 4-port combining network configurations, programmable control systems, professionally designed cross-axis waveguide kits, feed rotation systems, anti-icing equipment and pressurization systems.

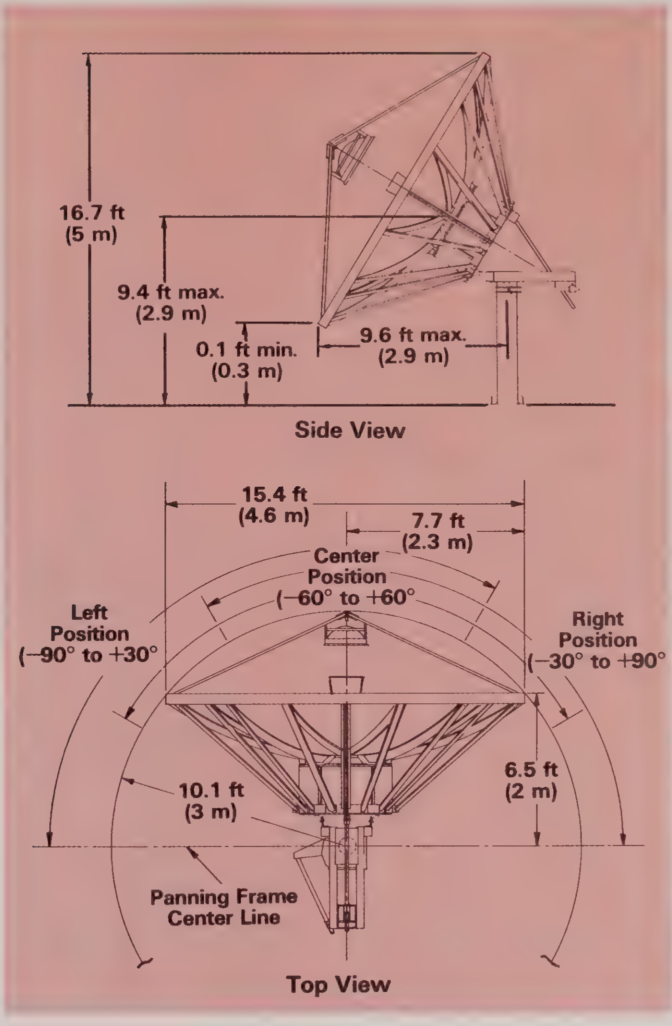
Type Number	ESA46-114	ESA46-124	ESA46-134
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	53.4	53.8	54.2
Transmit	55.4	55.4	55.4
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
–3 dB Receive (Transmit)	0.36 (0.28)	0.34 (0.28)	0.32 (0.28)
–15 dB Receive (Transmit)	0.70 (0.54)	0.67 (0.54)	0.64 (0.54)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	51	51	51
30° Elevation	41	41	41
50° Elevation	38	38	38
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	35	35	35

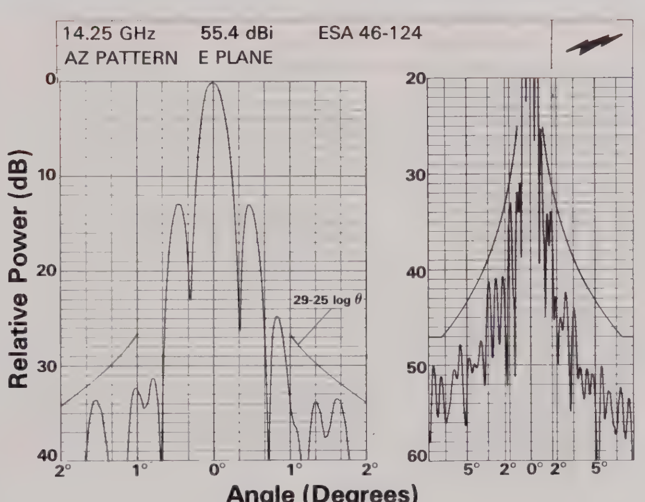
Mechanical Specifications	
Antenna Diameter	4.6m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum 16 Panel Segments
Antenna Pointing Range*: Coarse (Continuous)	
Elevation	(0-90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Dual-Speed Power	208VAC; 3 phase; 60 Hz
Elevation, low (high)	0.1°/sec (0.4°/sec)
Azimuth, low (high)	0.1°/sec (0.4°/sec)
Polarization	2.5°/sec
Weight, Net	2400 lb (1089 kg)
Shipping (Typical)	3000 lb (1361 kg)
Material/Finish	
Main Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure	
Diameter	48 in (122 mm)
Depth	24 in (610 mm)

*Manual mount includes hand crank for 15° continuous azimuth/elevation adjustment.

Environmental Specifications	
Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.036° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft² (1135 watts/m²)

Foundation Specifications (Typical)	
Type	Slab
Size	
Width	10 ft (3 m)
Depth	1.5 ft (1.5 m)
Length	10 ft (3 m)
Concrete	
Volume	5.5 yd³ (4.2 m³)
Compressive Strength	3000 lb/in² (211 kg/cm²)
Reinforcing Steel	285 lb (129 kg)
Soil Bearing Capacity	3000 lb/ft² (14646 kg/m²)
Conduit (PVC)	
Electrical	2 inch (51 mm)
IFL	4 inch (102 mm)





Actual range pattern

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

Earth Station Antennas
3.7-Metre

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds INTELSAT "E-1" and CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Galvanized Pedestal Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance
- **Large Equipment Enclosure**
- **Optional Motorized Mount**

The Andrew 3.7-metre earth station antennas are designed for high-density data and voice telecommunication networks as well as broadcast applications. These high performance antennas are currently utilized for a wide variety of telecommunication applications in countries throughout the world.

Advanced dual-reflector technology together with the single-piece precision spun aluminum reflector assembly results in extremely accurate surface contour, providing exceptionally high gain, superior efficiency and closely controlled pattern characteristics.

The single piece, precision reflector spinning ensures precise reflector shaping to exacting tolerances for maximized electrical performance characteristics. A large equipment enclosure capable of accommodating optional 4-port combining networks is directly attached to the rear of the reflector assembly.

The hot-dipped galvanized steel ground mount assembly ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from virtually any world-wide location. The easily installed pedestal mount allows for non-critical foundation orientation.

Available equipment options include 2- or 4-port combining network configurations, dual- or single-speed motor drive systems for worldwide applications, programmable control systems, feed rotation systems, anti-icing equipment and pressurization systems.

Type Number	ESA37-114A	ESA37-124A	ESA37-134A
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	51.3	51.7	52.1
Transmit	53.2	53.2	53.2
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
−3 dB Receive (Transmit)	0.44 (0.36)	0.42 (0.36)	0.40 (0.36)
−15 dB Receive (Transmit)	0.85 (0.69)	0.83 (0.69)	0.80 (0.69)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	48	48	48
30° Elevation	38	38	38
50° Elevation	35	35	35
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	35	35	35

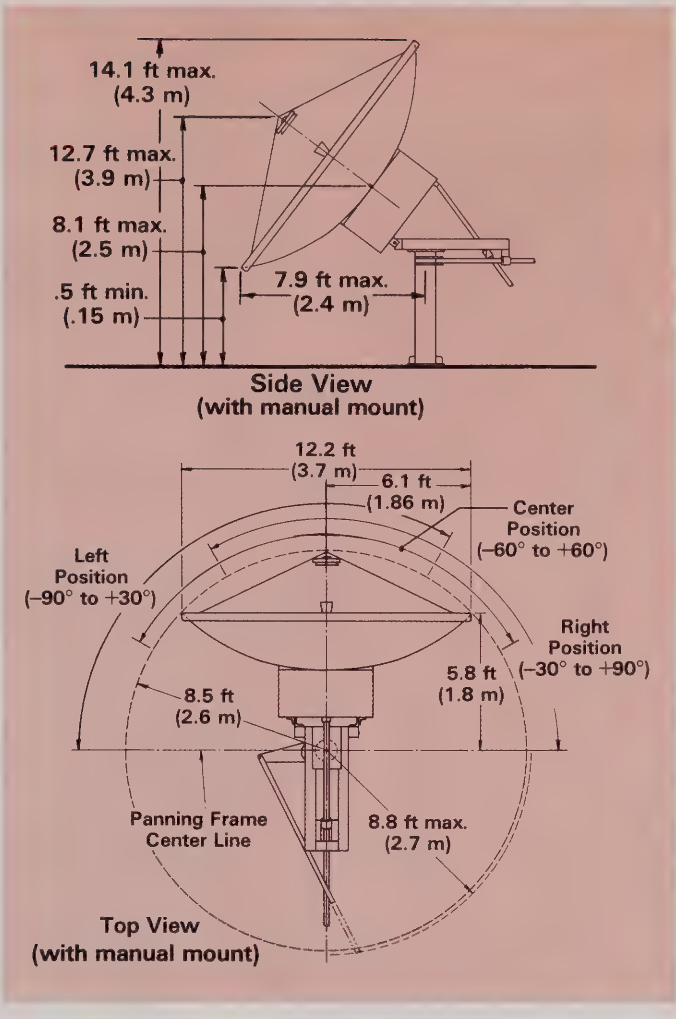
Mechanical Specifications

Antenna Diameter	3.7m
Antenna Type	Gregorian, Dual-Reflector
Subreflector Type	Elipsoid
Mount Type	EL over AZ
Reflector Construction	Aluminum Homogenous Spinning
Antenna Pointing Range*: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	180°
Motor Drive System, Travel Rates**	
Dual-Speed Power (mount not shown)	208VAC; 3 phase; 60 Hz
Elevation, low (high)	0.10°/sec (0.40°/sec)
Azimuth, low (high)	0.10°/sec (0.40°/sec)
Polarization	2.5°/sec
Weight, Net	1200 lb (544 kg)
Shipping (Typical)	2000 lb (907 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure	
Diameter	48 in (1219 mm)
Depth	24 in (610 mm)

*Manual mount includes hand crank for 15° continuous azimuth/elevation adjustment.
**Optional motorized version includes taller mount.

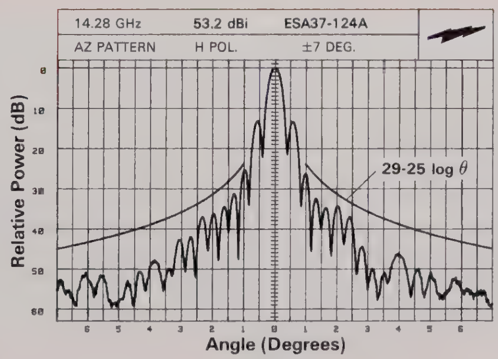
Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h) without ice 87 mph (140 km/h) with 1 in (25 mm) of radial ice
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.039° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft² (1135 watts/m²)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.



Foundation Specifications (Typical, manual mount)

Type	Slab
Size	
Width	9 ft (2.7 m)
Depth	1 ft (0.3 m)
Length	9 ft (3.7 m)
Concrete	
Volume	3 yd³ (2.3 m³)
Compressive Strength	3000 lb/in² (211 kg/cm²)
Reinforcing Steel	200 lb (91 kg)
Soil Bearing Capacity	3000 lb/ft² (14646 kg/m²)
Conduit (PVC)	
Electrical	2 in (51 mm)
IFL	4 in (102 mm)



Actual satellite pattern measured upon completion of Andrew installation/alignment

1.8-Metre Antenna with Optional 100 mph (161 km/h) Pyramidal Mount

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds CCIR 580 Requirements
- **Precisely Shaped Optics**
  Exceptionally High Gain
  Superior Pattern Characteristics
- **Galvanized Elevation-Over-Azimuth Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance

Andrew's Ku-band Small Aperture Terminal (K-SAT) earth station antennas are engineered to achieve the superior pattern performance requirements of interactive data and voice telecommunication network applications. These easily installed 1.8-, 2.4- and 3.0-metre antennas are offered in linearly polarized transmit/receive configurations ideally suited as terminals for large star and mesh type two-way telecommunication networks.

The uniquely shaped, rear-fed, J-hook feed system, together with the single-piece precision spun aluminum reflector assembly maximize pattern performance and transmit gain.

The hot-dipped galvanized steel ground mount assembly with 125 mph (200 km/h) wind survivability rating ensures extended product life.

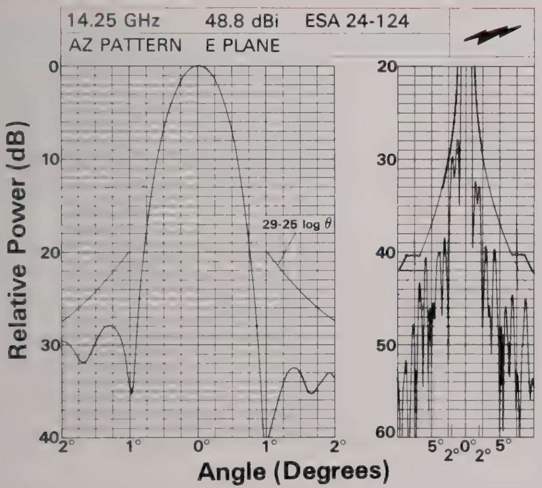
Available options include linear orthogonal or coplanar 2- and 4-port combining network configurations for receive/transmit applications, cost-effective pyramidal mount for 1.8-metre antennas with 100 mph (161 km/h) wind survivability rating, pressurization systems and coaxial cable.

Type Number	ESA18-114	ESA18-124	ESA18-134
Electrical Specifications			
Operating Frequency Band, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	44.5	44.8	45.3
Transmit	46.5	46.5	46.5
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
−3 dB Receive (Transmit)	1.04 (0.87)	0.99 (0.87)	0.95 (0.87)
−15 dB Receive (Transmit)	2.25 (1.85)	2.05 (1.85)	2.00 (1.85)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	61	58	57
30° Elevation	45	42	40
40° Elevation	42	40	37
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	30	30	30

Type Number	ESA24-114	ESA24-124	ESA24-134	ESA30-114	ESA30-124	ESA30-134
Electrical Specifications						
Operating Frequency, GHz						
Receive	10.95-11.70	11.70-12.20	12.25-12.75	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-Band						
Receive	46.8	47.5	48.0	48.2	48.6	48.7
Transmit	48.8	48.8	48.8	49.7	49.7	49.7
Polarization	Linear	Linear	Linear	Linear	Linear	Linear
VSWR, Maximum:						
Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-Band, Degrees						
–3 dB Receive (Transmit)	0.81 (0.67)	0.78 (0.67)	0.72 (0.67)	0.69 (0.58)	0.64 (0.58)	0.61 (0.58)
–15 dB Receive (Transmit)	1.80 (1.41)	1.70 (1.41)	1.55 (1.41)	1.48 (1.22)	1.40 (1.22)	1.35 (1.22)
Antenna Noise Temperature at Feed Interface, ±2K						
10° Elevation	70	67	65	69	66	64
30° Elevation	55	52	50	54	51	49
40° Elevation	52	50	48	51	49	47
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580					
Tx Power Handling Capability, kW (per port)	2	2	2	2	2	2
Feed Interface Flanges mate with,						
Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40	40	40	40
Cross-Polarization						
Discrimination, dB	30	30	30	30	30	30

Mechanical Specifications

Antenna Diameter	1.8, 2.4, 3.0m
Antenna Type	Prime Focus, J-Hook
Mount Type	EL over AZ
Reflector Construction	Aluminum Homogenous Spinning
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-68° (10°)
Azimuth	90° (10°)
Polarization	360° (120°)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel



Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h) without ice 87 mph (140 km/h) with 2 in (51 mm) radial ice
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail or truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capablities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

The Andrew 1.8- and 1.5-metre earth station antennas are optimized to ensure the high performance operational requirements of Ku-band private voice and data network usage as well as Direct Broadcast by Satellite (DBS) applications. These high performance receive-only antennas meet or exceed Canadian DOC Specification RSP 116/Australian DOC Specification 512 and are currently utilized for a wide variety of telecommunication applications in countries throughout the world.

Andrew's circular symmetric prime focus feed system, together with the precision formed reflector assembly results in extremely accurate surface contour, providing exceptionally high gain, superior efficiency and closely controlled pattern characteristics. The mount interface bracket assembly ensures ease of installation, durability and minimal maintenance. Horizon-to-horizon coverage from virtually any world-wide location can be achieved with the antenna mounted on a customer-supplied support pipe. The versatile mount interface bracket design allows for non-critical foundation orientation.

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

Type Number	ESA15-11	ESA15-12	ESA15-13	ESA18-11	ESA18-12	ESA18-13
Electrical Specifications						
Operating Frequency, GHz, Receive	10.95-11.70	11.70-12.20	12.25-12.75	10.95-11.70	11.70-12.20	12.25-12.75
Gain, Steady State, Mid-Band, ±0.2 dBi	42.8	43.2	43.7	45.0	45.5	45.8
Polarization	Linear	Linear	Linear	Linear	Linear	Linear
VSWR, Maximum: Receive	1.40	1.40	1.40	1.30	1.30	1.30
Beamwidth, Mid-Band, Degrees						
–3 dB Receive	1.32	1.28	1.26	0.96	0.91	0.87
–15 dB Receive	2.70	2.65	2.60	2.02	1.91	1.83
Antenna Noise Temperature at Feed Interface, ±2K 30° Elevation	30	30	30	35	35	35
Radiation Pattern Performance	Per Canadian DOC Specification RSP 116 and Per Australian DOC Specification 512					
Feed Interface Flanges mate with, Receive	WR75	WR75	WR75	WR75	WR75	WR75
Cross-Polarization Discrimination, dB on axis	30	30	30	30	30	30

Mechanical Specifications	ESA15	ESA18
Antenna Diameter	1.5m	1.8m
Antenna Type	Prime Focus Circular Symmetric	Prime Focus Circular Symmetric
Mount Type	EL over AZ	EL over AZ
Support Pipe Diameter	2 in (51 mm) nominal pipe	4 in (102 mm) nominal pipe
Reflector Construction	Stretch Formed Steel	Aluminum Spinning
Antenna Pointing Range: Coarse (Continuous)		
Elevation	0-90° (25°-70°)*	0-90°
Azimuth	360° (20°)	360°
Polarization	360°	360°
Weight, Net	82 lb (37 kg)	65 lb (30 kg)
Material/Finish		
Reflector	Steel, galvanized primed and painted with highly diffusive white paint	Aluminum, chromate converted and painted with highly diffusive white paint
Mount Bracket	Aluminum	Aluminum
Installation Hardware	Stainless	Stainless and hot-dipped galvanized steel

*Adjustment screws available upon request.

Environmental Specifications	
Wind Loading, Survival	100 mph (161 km/h)
Temperature, Operational	–40° to 125°F (–40° to 52°C)

accurate surface contours, providing superior electrical performance characteristics. The aluminum stretch formed reflector panel skins are vacuum molded and permanently bonded to a honeycomb core to reduce excessive weight.

The hot-dipped galvanized steel ground mount assembly ensures maximum durability with minimal maintenance while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Available equipment options include various 2-and 4-port combining network configurations, programmable control systems which enable precision antenna positioning with extremely accurate repeatability when utilized in conjunction with the motorized drive system, professionally designed and documented cross-axis waveguide kits, anti-icing equipment, rain deviators and pressurization systems.

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds CCIR 580 Requirements
- **Gregorian Optics**
  Exceptionally High Gain
- **Motorized Ground Mount Assembly**

The new Ka-band earth station antennas from Andrew incorporate performance and operational characteristics particularly suited for high-density data and voice telecommunication networks as well as various military applications.

The uniquely formed dual-reflector Gregorian system, coupled with close-tolerance manufacturing techniques, results in extremely

Type Number	ESA42-203CP	ESA42-203
Electrical Specifications		
Operating Frequency, GHz		
Receive	17.70-21.20	17.70-21.20
Transmit	27.50-31.00	27.50-31.00
Gain, Steady State, Mid-band, ±0.2 dBi		
Receive	56.4	56.6
Transmit	60.2	60.4
Polarization	Circular	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees		
–3 dB Receive (Transmit)	0.23 (0.15)	0.23 (0.15)
–15 dB Receive (Transmit)	0.43 (0.28)	0.43 (0.28)
Antenna Noise Temperature at Feed Interface, ±2K		
10° Elevation	69	56
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580	
Tx Power Handling Capability, kW (per port)	.250	.250
Feed Interface Flanges mate with, Receive (Transmit)	WR42 (WR28)	WR42 (WR28)
Isolation, Tx into Rx, dB	26	38
Cross-Polarization Discrimination, dB, on axis	20	27

Mechanical Specifications	
Antenna Diameter	4.2m*
Antenna Type	Gregorian Dual Reflector
Subreflector Type	Ellipsoid
Mount Type	EL over AZ
Reflector Construction	2 segment, honeycomb fabrication
Antenna Pointing Range: Coarse (Continuous)	
Elevation	32-60° (28°)**
Azimuth	20° (±10°)
Polarization	180°
Motor Drive System, Travel Rates	
Single-Speed Power	48VAC or 115VAC; 1 phase; 60 Hz
Elevation	0.0063°/sec
Azimuth	0.0066°/sec
Polarization	manual
Weight, Net	1880 lb (853 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Hot-dipped galvanized steel
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel

*Additional antenna sizes and operating frequencies are available upon request.
**Optional 20-48° (28°).

Environmental Specifications	
Wind Loading	
Survival (steady state)	65 mph (105 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	–40° to 125°F (–40° to 52°C)

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit Band
  Meets or Exceed CCIR 580 Requirements
- **Frequency Reuse Capability**
  Four-Port Combiner Permits Fixed Audio Channel Satellite Operation
- **Prime Focus Offset Feed System**
  Zero Aperture Blockage
  Superior Pattern Characteristics
- **Motorized Antenna Feed/Mount Assemblies**
  Feed Rotation System Allows ±90° of Continuous Polarization Adjustment
  Heavy Duty Mount Provides Precision Antenna Positioning in Both Azimuth and Elevation Axes
- **Remote Antenna Control**
  Increased System Versatility
- **Galvanized Elevation-Over-Azimuth Pedestal Mount**
  Maximum Durability with Minimal Maintenance

The new van-mountable 2.3-metre prime focus offset fed antennas from Andrew incorporate performance and operational characteristics particularly suited for television broadcast industry satellite news gathering applications. These high performance antennas are specifically designed for mobile transmit/receive systems requiring versatile frequency reuse capability. Andrew's 2.3-metre mobile antennas are offered in transmit/receive configurations and are currently being utilized as the integral component of major television broadcasting network systems.

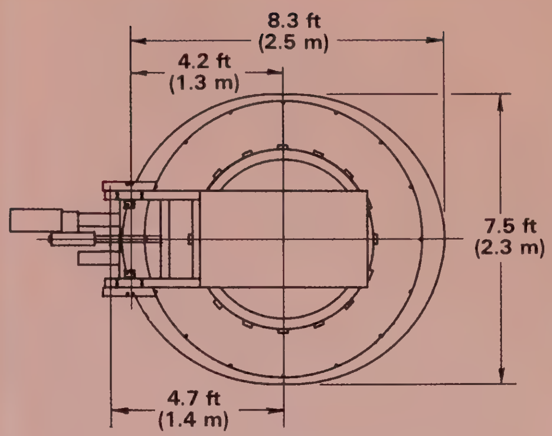
The uniquely designed pedestal mount allows convenient vehicle interfacing via the precision engineered motorized antenna positioner assembly. The remote antenna control system enables precision motorized positioning of the azimuth, elevation and polarization axes as well as easy deployment and stowage functions.

Andrew's exclusively designed prime focus, beam-shaping feed configuration, together with the precision spun aluminum reflector assembly, produces extremely high gain, superior efficiency and closely controlled pattern characteristics.

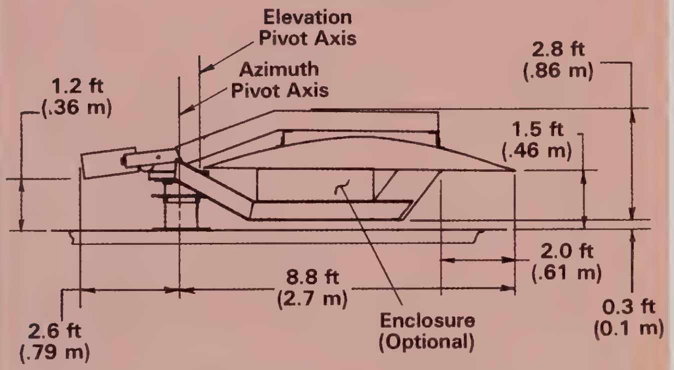
Type Number	ESA23VM-114	ESA23VM-124	ESA23VM-134
Electrical Specifications			
Operating Frequency, GHz			
Receive	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	14.00-14.50	14.00-14.50	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi			
Receive	47.0	47.3	47.7
Transmit	49.1	49.1	49.1
Polarization	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-band, Degrees			
−3 dB Receive (Transmit)	0.86 (0.63)	0.84 (0.63)	0.82 (0.63)
−15 dB Receive (Transmit)	1.72 (1.42)	1.68 (1.42)	1.64 (1.42)
Antenna Noise Temperature at Feed Interface, ±2K			
10° Elevation	58	58	58
30° Elevation	49	49	49
40° Elevation	49	49	49
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580		
Tx Power Handling Capability, kW (per port)	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	40	40	40
Cross-Polarization Discrimination, dB, on axis	35	35	35

Mechanical Specifications

Antenna Diameter	2.3m
Antenna Type	Offset/Prime Focus
Mount Type	EL over AZ
Reflector Construction	Composite Aluminum
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-65° (65°)
Azimuth	360° (330°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Single Speed-Power	115VAC; 1 phase; 60 Hz
Elevation	0.3°/sec
Azimuth	0.4°/sec
Polarization	1.8°/sec
Weight, Net	
Antenna	470 lb (213 kg)
Positioner	450 lb (204 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel
Enclosure (optional)	
Length	36 in (94 mm)
Width	24 in (610 mm)
Height	11 in (279 mm)

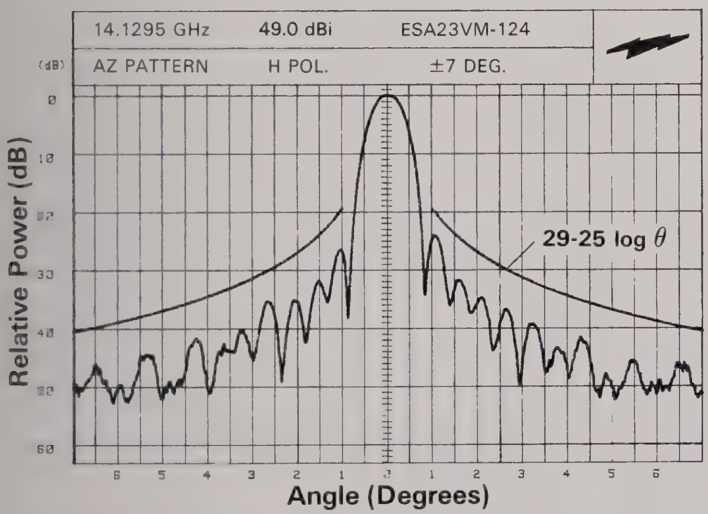


Top View
Shown in Stowed Position



Side View
Shown in Stowed Position

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.



Actual satellite pattern measured upon completion of Andrew installation/alignment

Environmental Specifications

Wind Loading	
Survival (steady state)	65 mph (105 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
High Wind Operation	55 mph (88 km/h) and above with clamp
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	−40° to 125°F (−40° to 52°C)
Pointing Accuracy	
30 mph (48 km/h) winds gusting to 45 mph (72 km/h)	0.1° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail or truck shipment
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas

Features:

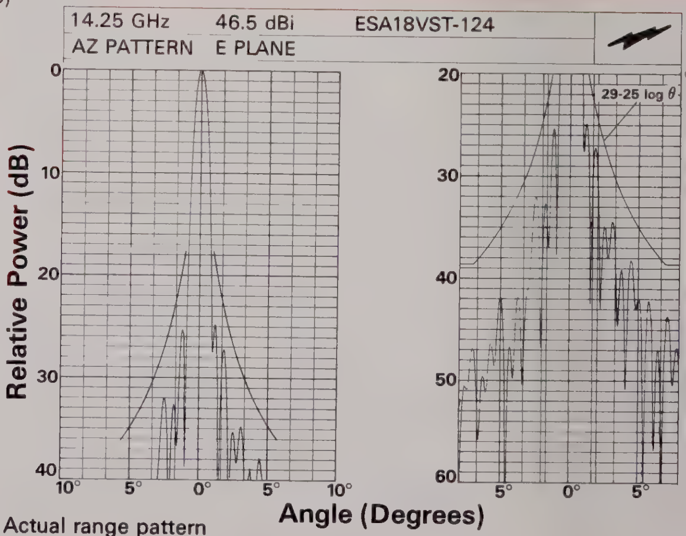
- **Excellent Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Optimum Aperture for Network "Blanket" Licensing
- **Prime Focus Offset Feed System**
  Excellent Pattern Characteristics
  Eliminates Transmit Waveguide Degradation

The new 1.8-metre Very Small Aperture Terminal (VSAT) earth station antenna from Andrew incorporates performance and operational characteristics particularly suited for high-speed, two-way, voice/data telecommunication network applications. The VSAT antenna is specifically designed for business transmit/receive commuication systems requiring high performance Ku-band operation in a single cost effective package. Available mount types include ground, wall and non-penetrating roof configurations.

Type Number	ESA18VST-124
Electrical Specifications	
Operating Frequency, GHz	
Receive	11.70-12.20
Transmit	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi	
Receive	45.0
Transmit	46.5
Polarization	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)
Beamwidth, Mid-band, Degrees	
–3 dB Receive (Transmit)	0.87 (0.74)
–15 dB Receive (Transmit)	1.76 (1.48)
Antenna Noise Temperature at Feed Interface, ±2K	
10° Elevation	46
30° Elevation	37
40° Elevation	37
Radiation Pattern Performance	Per FCC Regulation 25-209
Tx Power Handling Capability, kW (per port)	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)
Isolation, Tx into Rx, dB	40
Cross-Polarization Discrimination, dB, on axis	35

Environmental Specifications	
Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	40 mph (64 km/h) gusting to 55 mph (88 km/h)
Temperature, Operational	–40° to 125°F (–40° to 52°C)
Pointing Accuracy 40 mph (64 km/h) Winds Gusting to 55 mph (88 km/h)	0.09° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft² (1135 watts/m²)

Mechanical Specifications	
Antenna Diameter	1.8m
Antenna Type	Offset/Prime Focus
Mount Type	Ground/Wall/ Non-Penetrating Roof
Reflector Construction	Single Piece, Stretch Formed
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (10°)
Azimuth	180° (10°)
Polarization	360° (180°)
Weight, Net	100 lb (45 kg)
Shipping (Typical)	150 lb (68 kg)
Volume, Shipping (Typical)	60 ft³ (1.7 m³)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel



Actual range pattern

Features:

- **Superior Performance**
  FCC 25-209 Compliant Across Entire Transmit/Receive Bands
  Meets or Exceeds CCIR 580 Requirements
- **Prime Focus Feed System**
  Exceptionally High Gain
  Superior Pattern Characteristics

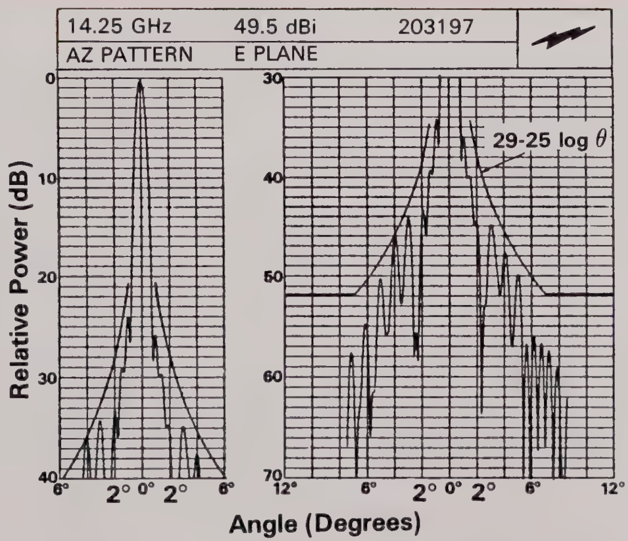
Andrew Corporation's 2.3-metre satellite news gathering antenna achieves high gain and radiation pattern characteristics required for television broadcast industry news gathering network applications. This shielded antenna incorporates a shock absorbing feed support system and is specifically designed for mobile transmit/receive systems operating in the Ku frequency band. This circular symmetric antenna is currently being utilized as the integral component of major television broadcasting network systems.

Andrew's exclusively designed prime focus, center fed feed system, together with the single-piece precision formed aluminum reflector assembly, produces extremely high gain with closely controlled pattern characteristics. The 2.3-metre earth station antenna complies with FCC Regulation 25-209 and CCIR Recommendation 580 standards for 2° satellite spacing operation.

Available options include pressurization systems and coaxial cable assemblies.

Type Number	**203197**
Electrical Specifications	
Operating Frequency, GHz Receive Transmit	 11.70-12.20 14.00-14.50
Gain, Steady State, Mid-Band, ±0.2 dBi Receive Transmit	 48.0 49.5
Polarization VSWR, Maximum: Receive (Transmit)	Linear 1.25 (1.25)
Beamwidth, Mid-Band, Degrees –3 dB Receive (Transmit) –15 dB Receive (Transmit)	 0.80 (0.67) 1.57 (1.32)
Antenna Noise Temperature at Feed Interface, ±2K 10° Elevation 30° Elevation 50° Elevation	 40 35 21
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580
Tx Power Handling Capability, kW (per port)	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)
Isolation, Tx into Rx, dB	35
Cross-Polarization Discrimination, dB on axis	30

Mechanical Specifications	
Antenna Diameter Antenna Type Reflector Construction	2.3m Circular Symmetric/Prime Focus Aluminum, Homogenous Spinning
Weight, Net Shipping (Typical)	150 lb (68 kg) 350 lb (159 kg)
Material/Finish Reflector/Back Structure	 Aluminum, chromate converted and painted with highly diffusive white paint
Installation Hardware	Stainless and hot-dipped galvanized steel
Wind Loading, Survival	125 mph (200 km/h) without ice 87 mph (140 km/h) with 1 in (25 mm) radial ice
Temperature, Operational	–40° to 125°F (–40° to 52°C)



Actual range pattern

Features:

- **Superior Performance**
  FCC-25-209 Compliant Across Entire Transmit/Receive C-Band
- **Prime Focus Feed System**
  Exceptionally High Gain
  Superior Pattern Characteristics
- **Rapid Deployment**
  Operational Within 15 Minutes
- **Multiple Feed System Configurations**
  Available Feed Systems for C-, Ku-, or Simultaneous C-/Ku-Band Operation
- **Hydraulically Controlled**
  Hydraulic Positioning and Braking Systems

The Andrew 4.5-metre mobile earth station antennas are designed for both single- and dual-polarized operation at C- or Ku-band frequencies. The antennas incorporate a hinged parabolic reflector with an integral feed system and can be deployed and made operational within 15 minutes by one person. Easy to use, quick release fasteners are designed for long life and repeated use.

The hydraulic antenna positioner utilizes an elevation-over-azimuth type mount configuration and is powered by a 12-volt rechargeable battery with charging unit. The battery is recharged while the antenna is in transit. Conveniently located hydraulic controls include a locking cover to prevent unauthorized operation.

The tandem axle mobile antenna system is light weight and can be transported by any vehicle capable of towing 4400 lb (2000 kg) with a tongue weight of 350 lb (160 kg). Maximum width is 8 ft (2.44 m).

Available equipment options include a Hypalon cover to protect the reflector and feed system during transit and a reflector mounted inclinometer to provide accurate antenna alignment.

Type Number	ESA45M-4	ESA45M-46	ESA45M-12	ESA45M-124	ESA46M-114	ESA46M-124	ESA46M-134
Electrical Specifications							
Operating Frequency, GHz							
Receive	3.7-4.2	3.7-4.2	11.70-12.20	11.70-12.20	10.95-11.70	11.70-12.20	12.25-12.75
Transmit	—	5.925-6.425	—	14.0-14.5	14.0-14.5	14.0-14.5	14.0-14.5
Gain, Steady State, Mid-Band, ±0.2 dBi							
Receive	44.2	43.8	53.0	53.0	53.4	53.8	54.2
Transmit	—	46.2	—	54.0	55.4	55.4	55.4
Polarization	Linear	Linear	Linear	Linear	Linear	Linear	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (—)	1.30 (1.30)	1.30 (—)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)	1.30 (1.30)
Beamwidth, Mid-Band, Degrees −3 dB Receive (Transmit)	1.20 (—)	1.22 (0.85)	0.42 (—)	0.42 (0.30)	0.36 (0.28)	0.34 (0.28)	0.32 (0.28)
Antenna Noise Temperature at Feed Interface, ±2K							
10° Elevation	30	32	32	32	51	51	51
30° Elevation	20	21	21	21	41	41	41
Radiation Pattern Performance	Per FCC Regulation 25-209 Across C-Band				AUSSAT Network Designers Guide		
Tx Power Handling Capability, kW (per port)	—	2	—	2	2	2	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (—)	WR75 (WR75)	WR75 (—)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)	WR75 (WR75)
Isolation, Tx into Rx, dB	—	40	—	40	40	40	40
Cross-Polarization Discrimination, dB on axis	30	30	30	30	35	35	35

Features:

- **Superior Performance**
  AUSSAT Compliant Across Entire Transmit/Receive Ku Frequency Band
- **Gregorian Optics**
  Exceptionally High Gain
  Excellent Operational Efficiency
- **Rapid Deployment**
  Motorized Control to Ensure Minimial Deployment Duration
- **Large Transportable Trailer**
  Enables Mounting of Uplink/Downlink Equipment

The Andrew 4.6-metre mobile earth station antennas are specifically designed for various data/voice and video service applications in the Ku frequency band. The antennas incorporate a hinged parabolic reflector with an integral Gregorian feed system and can be deployed and made operational within 15 minutes by one person. Easy to use, quick release fasteners are designed for long life and repeated use.

The motorized antenna positioner utilizes an elevation-over-azimuth type mount configuration and is powered by an electrical diesel generating unit.

The heavy duty, single axle mobile antenna system is light weight and can be transported by any vehicle capable of towing 2900 lb (1300 kg) with a tongue weight of 350 lb (160 kg). Maximum width is 8 ft (2.44 m).

The elevation-over-azimuth mount assembly is capable of 120° of continuous azimuth travel. Elevation travel is continuous from 10 to 85° while the polarization adjustment range is 180°.

The motorized drive systems, when utilized in conjunction with the optional earth station system controller, enable dual-speed precision antenna positioning with extremely accurate repeatability.

Available equipment options include 3- or 4-port linear combining networks, programmable control systems, equipment enclosures, a rain deviator and pressurization systems.

Mechanical Specifications	ESA45M	ESA46M
Antenna Diameter	4.5M	4.6M
Antenna Type	Prime Focus	Gregorian, Dual Reflector
Subreflector Type	—	Ellipsoid
Mount Type	Trailer Mounted	Trailer Mounted
Reflector Construction	Aluminum, Homogenous	Spinning, Sectional
Antenna Pointing Range: Coarse (Continuous)		
Elevation	0-90°	10-90° (10°-85°)
Azimuth	(360°)	120°
Polarization	(360°)	180°
Drive Systems, Travel Rates	Variable Speed Power 12VDC	Dual Speed Power 415VAC, 3 phase, 50 Hz
Elevation, low (high)	2.0°/sec max	0.06°/sec (0.26°/sec)
Azimuth, low (high)	0.6°/sec max	0.15°/sec (0.66°/sec)
Polarization	—	0.60°/sec
Weight, Net	4000 lb (1814 kg)	2866 lb (1300 kg)
Material/Finish		
Reflector and Back Structure	Aluminum chromate converted and painted with highly diffusive white paint	Aluminum, nichrome conversion etched and painted with highly diffusive polyurethane white paint
Trailer	Steel, zinc-rich primered and painted with high gloss white paint	
Installation Hardware	Stainless and hot-dipped galvanized steel	

Environmental Specifications		
Type	ESA45M	ESA46M
Wind Loading		
Survival (steady state)	65 mph (105 km/h)	100 mph (160 km/h)
Operational	Gusting to 50 mph (80 km/h)	Gusting to 45 mph (72 km/h)
Temperature Operational	−40° to 125°F (−40° to 52°C)	
Seismic (earthquake)	Grade 11-Mercalli Scale	
Rain	4 in (102 mm)/hour	
Relative Humidity	100%	
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)	
Shock and Vibration	As encountered by commercial air, rail or truck shipment.	
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.	

Features:

- **Dual-Band Operation**
  Simultaneous C- and Ku-Band Reception
- **Prime Focus Feed System**
  Exceptionally High Gain
  Superior Pattern Characteristics
- **Galvanized Pedestal Ground Mount Assembly**
  Maximum Durability with Minimal Maintenance

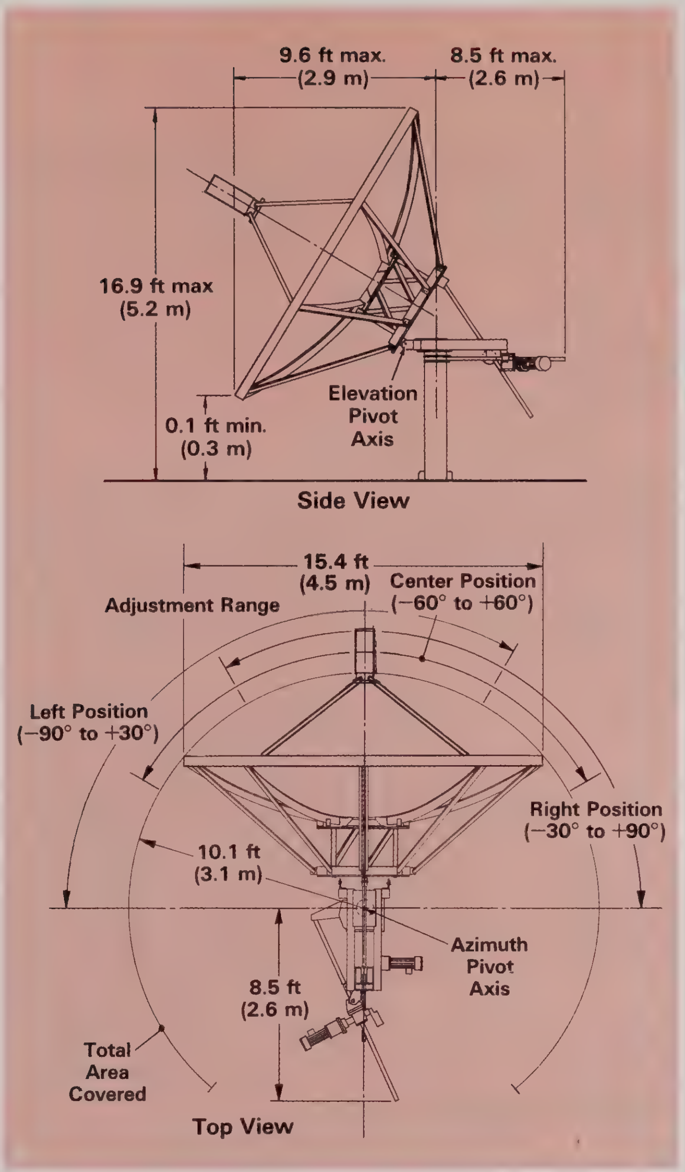
The new 4.5-metre "hybrid" receive only earth station antenna from Andrew incorporates performance and operational characteristics particularly suited for various broadcast industry applications as well as high-density data and voice communication networks. This high performance antenna is capable of dual polarized simultaneous reception in both the C- and Ku-band frequencies (4-port).

Andrew's unique prime focus, beam-shaping feed and ground plane configuration, together with precision spun aluminum reflector panel segments, produces superior electrical performance characteristics.

The hot-dipped galvanized steel ground mount ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance. The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from virtually any world-wide location. The easily installed pedestal mount allows for non-critical foundation orientation and is capable of 180° of azimuth travel via three 120° continuous ranges with 30° overlap. Elevation travel is continuous from 0 to 90°.

A variety of optional equipment and services are offered from Andrew to further enhance the operational capabilities of the 4.5-metre earth station antenna system. Available equipment options include programmable control systems which allow precision antenna positioning with extremely accurate repeatability and pressurization systems.

Type Number	ESA45-412	
Electrical Specifications	**C-Band**	**Ku-Band**
Operating Frequency, GHz Receive	3.7-4.2	11.70-12.20
Gain, Steady State, Mid-band, ±0.2 dBi Receive	43.8	52.5
Polarization VSWR, Maximum: Receive	Linear 1.30	Linear 1.30
Beamwidth, Mid-band, Degrees −3 dB Receive −15 dB Receive	 1.20 2.40	 0.40 0.80
Antenna Noise Temperature at Feed Interface, ±2K 10° Elevation 30° Elevation 50° Elevation	 32 20 19	 48 38 35
Radiation Pattern Performance	Per FCC Regulation 25-209 and Per CCIR Recommendation 580	
Feed Interface Flanges mate with, Receive Cross-Polarization Discrimination, dB, on axis	CPR229G 30	WR75 30



Mechanical Specifications

Antenna Diameter	4.5m
Antenna Type	Prime Focus
Mount Type	EL over AZ
Reflector Construction	Aluminum, 6 Panel Segments
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)
Motor Drive System, Travel Rates	
Dual-Speed Power	208VAC; 3 phase; 60 Hz
Elevation, low (high)	0.10°/sec (0.40°/sec)
Azimuth, low (high)	0.10°/sec (0.40°/sec)
Polarization	2.5°/sec
Weight, Net	2400 lb (1089 kg)
Shipping (Typical)	3000 lb (1361 kg)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Back Structure	Aluminum, chromate converted and painted with high gloss white paint
Ground Mount	Hot-dipped galvanized steel
Installation Hardware	Stainless and hot-dipped galvanized steel

Foundation Specifications (Typical)

Type	Slab
Size	
Width	10 ft (3 m)
Depth	1.5 ft (.5 m)
Length	10 ft (3 m)
Concrete	
Volume	5.5 yd^3 (4.2 m^3)
Compressive Strength	3000 lb/in^2 (211 kg/cm^2)
Reinforcing Steel	285 lb (129 kg)
Soil Bearing Capacity	3000 lb/ft^2 (14646 kg/m^2)
Conduit (PVC)	
Electrical	2 in (51 mm)
IFL	4 in (102 mm)

Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Andrew's comprehensive service capabilities ensure the system installation meets or exceeds the specified requirements. Refer to pages 43-48 for additional information regarding Andrew Field Services.

Environmental Specifications

Wind Loading	
Survival (steady state)	125 mph (200 km/h)
Operational	45 mph (72 km/h) gusting to 65 mph (105 km/h)
Motor Drives	To 65 mph (105 km/h)
Temperature	
Operational	−40° to 125°F (−40° to 52°C)
Pointing Accuracy 30 mph (48 km/h) Winds Gusting to 45 mph (72 km/h)	0.03° RMS
Seismic (earthquake)	Grade 11-Mercalli Scale
Rain	4 in (102 mm)/hour
Relative Humidity	100%
Solar Radiation	360 BTU/hr/ft^2 (1135 watts/m^2)
Shock and Vibration	As encountered by commercial air, rail and truck shipment.
Atmospheric Conditions	As encountered in corrosive coastal and industrial areas.

Features:

- **High Performance**
  CCIR 365-1 Compliant
- **Prime Focus Feed System**
  Exceptionally High Gain
- **Fully Transportable**
  Light Weight For Rapid Deployment

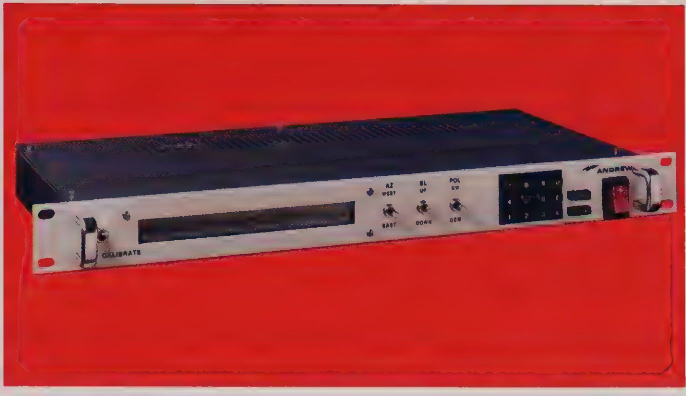
Andrew's 1.2-metre "suitcase" earth station antenna is optimized for portable analog or digital data/voice telecommunication network applications. This shielded antenna incorporates an integrated feed system and is specifically designed for portable transmit/receive systems operating in the Ku frequency band. The Andrew 1.2-metre antenna is engineered to exceed stringent CCIR requirements and specification standards. This circular symmetric high performance antenna is capable of being easily transported to any local or remote location.

Andrew's unique prime focus design, beam shaping feed system, together with the precision spun and segmented aluminum reflector assembly produces excellent electrical performance characteristics. The corrosion resistant aluminum mount assembly forms an integral packing frame which ensures extended product life and additional protection during transit. Use of stainless steel hardware throughout the antenna structure assures increased durability with minimal antenna maintenance. The versatile light weight aluminum mount enables horizon-to-horizon coverage from virtually any world-wide location and allows for non-critical orientation.

Type Number	ESA12P-124
Electrical Specifications	
Operating Frequency, GHz	
Receive	11.70-12.20
Transmit	14.00-14.50
Gain, Steady State, Mid-band, ±0.2 dBi	
Receive	41.8
Transmit	42.8
Polarization	Linear
VSWR, Maximum: Receive (Transmit)	1.30 (1.30)
Beamwidth, Mid-band, Degrees	
−3 dB Receive (Transmit)	1.40 (1.20)
Antenna Noise Temperature at Feed Interface, ±2K	
10° Elevation	54
20° Elevation	42
30° Elevation	38
Radiation Pattern Performance	Per CCIR Recommendation 365-1
Tx Power Handling Capability, kW (per port)	2
Feed Interface Flanges mate with, Receive (Transmit)	WR75 (WR75)
Isolation, Tx into Rx, dB	35
Cross-Polarization Discrimination, dB, on axis	30

Mechanical Specifications	
Antenna Diameter	1.2m
Antenna Type	Prime Focus
Mount Type	Self-Contained
Reflector Construction	Aluminum, 2 Panel Segments
Antenna Pointing Range: Coarse (Continuous)	
Elevation	0-90°
Azimuth	360° (10°)
Polarization	90°
Weight, Net	40 lb (18 kg)
Shipping (Typical)	40 lb (18 kg)
Volume, Shipping (Typical)	16 ft^3 (0.45 m^3)
Material/Finish	
Reflector	Aluminum, chromate converted and painted with highly diffusive white paint
Mount	Aluminum Tubing
Installation Hardware	Stainless steel

Environmental Specifications	
Wind Loading	
Survival (steady state)	87 mph (140 km/h)
Operational	Gusting to 35 mph (48 km/h)
Temperature, Operational	−60° to 125°F (−51° to 52°C)



The new Andrew microprocessor based earth station antenna controllers incorporate advanced technology and increased system flexibility to ensure accurate antenna positioning and ease of operation. Andrew offers two distinct controller types to meet the specific system requirements of telecommunication operators throughout the world.

Type AAC100 Antenna Controller Features

- **High Resolution**
  Enables Accurate Antenna Positioning
- **Cost Effective**
  Economical Antenna Control
- **Three Axis Control**
  Enables Control of Azimuth, Elevation and Polarization Axes
- **Low Profile**
  Occupies One 3-1/2 in (89 mm) Equipment Rack Unit
- **Forty Character Display**
  Optimum Viewing of Antenna Coordinates
- **Resolver Axis Encoding**
  Enables Superior Accuracy and Reliability
- **Angular Offset Capability**
  Allows Individual Axis Calibration to Achieve True Axes Positioning
- **Motion Indicator**
  Alerts Operator While Antenna is in Motion

The Type AAC100 antenna controller is primarily designed for stations utilizing a single satellite and require motorization for signal peaking and occasional movement to secondary satellites. The AAC100 provides manual high resolution control of the azimuth, elevation and polarization axes in a comprehensive, cost effective and easy to use system package. The microprocessor based controller utilizes resolver assemblies for extremely accurate and reliable antenna positioning. An inclusive forty character display provides easy viewing of antenna coordinates and includes a motion indicator to alert the operator while the antenna is in motion.

The Type APC100 programmable antenna controller incorporates additional programming capabilities to enable automatic antenna positioning to preprogrammed satellite coordinates for stations regularly accessing more than one satellite. The APC100 includes the same operational capabilities as the AAC100 with the following additional features:

APC100 Programmable Antenna Controller Features

- **Programmable Memory**
  Immediate Recall of Preprogrammed Satellite Coordinates
- **Automatic Antenna Positioning**
  Automatically Positions Antenna "On Command" to Selected Coordinates
- **Non-Volatile Memory**
  Retains Preprogrammed Data During Power Failure
- **Comprehensive Display**
  Exhibits Satellite Name and Orbital Location
- **Programmable Software Limits**
  Restricts Antenna Movement to Designated Range of Travel
- **Immediate Stop Key**
  Allows Immediate Access to Terminate Antenna Movement
- **RS422 Port**
  Allows Remote Computer Interface

The APC100 enables automatically controlled positioning of the azimuth, elevation and polarization axes based upon preprogrammed coordinates of selected satellites of interest. The microprocessor based controller incorporates an internal back-up battery to retain all previously stored programmed data should a power failure occur. The controller features a detailed visual display which exhibits both current antenna position data as well as a sequential listing of all preprogrammed satellite names and corresponding orbital locations. Preprogrammed software limits confine antenna and feed system movement to previously preset coordinates. An exclusive controller "Execute" key minimizes the possibility of operator error while an integral "Stop" key immediately discontinues all antenna movement.

Features:

- Low Insertion Loss
- Low VSWR Ratings
- Excellent Cross-Polar Characteristics
- High Degree of Isolation

Andrew offers a wide variety of combining networks for both linearly and circularly polarized applications. Single-, dual-, three- and four-port networks are available for C-band while single- and two-port receive-only, two-port receive/transmit and various four-port networks are provided for Ku-band system operation. When utilized in conjunction with Andrew antenna feed systems, the networks may be added or changed at the antenna and directly interfaced with the existing circular waveguide assembly with minimal modifications.

A motorized four-port C-band network option enables independent rotation of both the transmit and receive polarizations allowing compensation for Faraday rotation in full-frequency reuse systems. Circularly polarized dual receive-only and four-port networks achieve 1.06:1 axial ratio in both narrow and wide band versions.

C-Band Combining Network Characteristics

Type	Freq. GHz	Ports	Flange Type	Axial Ratio Max.	Additional Attenuation dB	Noise Temp. Contribution K	Transmit into Receive Isolation dB min.	Antenna VSWR Max.
Linear Polarization								
Single-Band* Dual-Polarized	3.7-4.2	2	CPR229G	—	0	0	—	1.30
Dual-Band Orthogonally Polarized	3.7-4.2 5.925-6.425	1 1	CPR229G CPR137G	— —	0 0	0	40	1.30 1.25
Dual-Band, Co-Polarized	3.7-4.2 5.925-6.425	1 1	CPR229G CPR137G	— —	0.1 0.1	3	30	1.30 1.25
Dual-Band, Three-Port	3.7-4.2 5.925-6.425	2** 1	CPR229G CPR137G	— —	0.1 0.1	4	30	1.30 1.25
Dual-Band, Four-Port	3.7-4.2 5.925-6.425	2** 2**	CPR229G CPR137G	— —	0.1 0.1	7	85	1.30 1.25
Dual-Band, Four-Port***	3.7-4.2 5.925-6.425	2** 2**	CPR229G CPR137G	— —	0.1 0.15	7	85	1.30 1.25
Circular Polarization								
Single-Band Dual-Polarized	3.7-4.2	2	CPR229G	1.06:1	0.05	3	—	1.30
Dual-Band, Four-Port	3.7-4.2 5.925-6.425	2 2	CPR229G CPR137G	1.06:1 1.06:1	0.15 0.15	9	85	1.30 1.25
Single-Band Dual-Polarized	3.625-4.2	2	CPR229G	1.06:1	0.05	3	—	1.30
Dual-Band, Four-Port	3.625-4.2 5.850-6.425	2 2	CPR229G CPR137G	1.06:1 1.06:1	0.15 0.15	9	85	1.30 1.25

*Receive only. **Orthogonally polarized. ***Independent rotation.

Ku-Band Combining Network Characteristics

Type	Freq. GHz	Ports	Flange Type	Axial Ratio Max.	Additional Attenuation dB	Noise Temp. Contribution K	Transmit into Receive Isolation dB min.	Antenna VSWR Max.
Linear Polarization								
Single Band Dual Polarized	10.95-11.7	2	WR75/PBR120 (Gasket)	—	0	0	—	1.30
Single Band Dual Polarized	11.7-12.2	2	WR75/PBR120 (Gasket)	—	0	0	—	1.30
Single Band Dual Polarized	12.25-12.75	2	WR75/PBR120 (Gasket)	—	0	0	—	1.30
Dual Band Two Port Orthogonally Polarized	10.95-11.7 14.0-14.5	1 1	WR75/PBR120 (Gasket)	— —	0	0	40	1.30 1.30
Dual Band Two Port Orthogonally Polarized	11.7-12.2 14.0-14.5	1 1	WR75/PBR120 (Gasket)	— —	0	0	40	1.30 1.30
Dual Band Two Port Orthogonally Polarized	12.25-12.75 14.0-14.5	1 1	WR75/PBR120 (Gasket)	— —	0	0	40	1.30 1.30
Dual Band Four Port	10.95-11.7 14.0-14.5	2 2	WR75/PBR120 (Gasket)	— —	0.2 0.2	15	85	1.30 1.30
Dual Band Four Port	11.7-12.2 14.0-14.5	2 2	WR75/PBR120 (Gasket)	— —	0.2 0.2	15	85	1.30 1.30
Dual Band Four Port	12.25-12.75 14.0-14.5	2 2	WR75/PBR120 (Gasket)	— —	0.2 0.2	15	85	1.30 1.30

Note: Multiple dual-band combiners are also available upon request.

Anti-Icing System Features:

- **Maintains Operational Efficiency of Antenna System During Extreme Climatic Conditions**
- **Automatic or Manually Controlled Operation**

Feed and main reflector anti-icing equipment is available from Andrew for use in areas where ice and/or snow accumulation would degrade overall electrical performance of the antenna system. Gregorian subreflector assemblies do not require anti-icing equipment due to the concave-shaped (ellipsoid) design. Main reflector heaters are permanently bonded to the rear of the reflector panels and are available in full- or half-reflector configurations. Anti-icing systems may be actuated manually, or automatically controlled by a thermostat/precipitation sensor assembly.

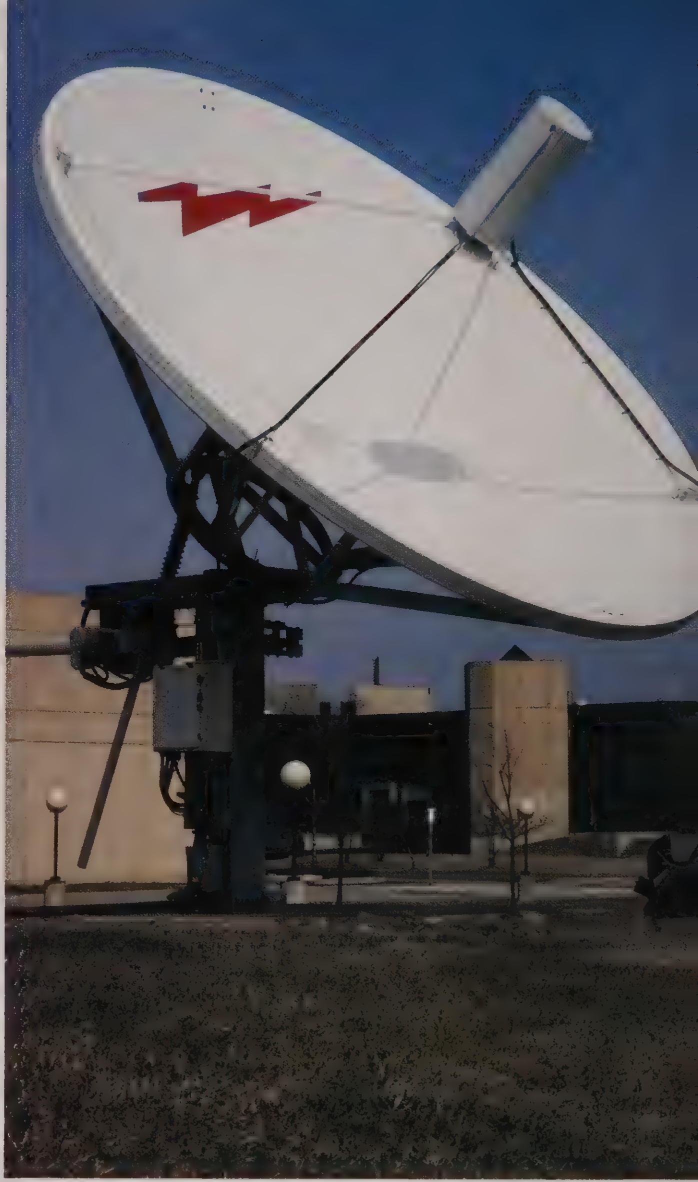
	Feed System Anti-Icing	Main Reflector Half-	Anti-Icing Full-
C-Band			
12-Metre	X	X	X
9.1-Metre	X	X	X
7.3-Metre	X	X	X
4.5-Metre	—	X	X
Ku/Ka-Band			
8-Metre	X	—	X
6.8-Metre	X	—	X
5.6-Metre	X	—	X
4.6-Metre	X	—	X
4.2-Metre	X	—	X
3.7-Metre	X	—	X

X indicates anti-icing availability.

Rain Deviator System Features:

- **Maintains Operational Efficiency of Antenna System During Extreme Climatic Conditions**
- **Manual Controlled Operation**

Rain deviator systems for Ku-band earth station antennas are available from Andrew for use on all Gregorian designed earth stations in tropical and/or other extremely precipitative sensitive areas where moisture accumulation on the feed window would degrade overall electrical performance of the antenna system. Rain deviator systems are manually actuated and minimize the effects of moisture attenuation on the antenna feed system.


Motorized 4.5-Metre C-/Ku-Band Earth Station Antenna

Andrew offers a wide variety of cost-effective telecommunication earth station antenna system packages designed to provide optimum performance capabilities. Among the antenna system packages offered are:

- Transmit/receive systems for C- and Ku-band operation
- Totally integrated mobile receive/transmit video satellite systems
- C- and Ku-band earth station antenna receive systems

Andrew can design, manufacture, field install and conduct complete system testing for all packages offered.

C-/Ku-Band Video Receive System

The Andrew C-/Ku-band video receive system provides the following features:

- Broadcast-quality video signal/noise performance for retransmission
- Meets EIA RS250B specifications
- Remote Control Operations
- Operates on C- or Ku-band satellites with full- or half-transponder
- Turnkey installation and system testing by Andrew

The Andrew C-/Ku-band video receive system represents state-of-the-art in satellite communications systems. This system offers integrated RF and baseband routing/switching, antenna positioning, frequency tuning, transponder configuration setting and audio subcarrier tuning. All system functions are remotely controlled through a supplied CRT keyboard terminal allowing for ease of operation and system monitoring. The console operator can receive satellite video signals from a selected transponder on any desired satellite in the domestic service.

System Components

The Antenna Subsystem includes:

- A 4.5-metre C-/Ku-band earth station antenna
- A motorized drive subsystem for azimuth, elevation and polarization axes
- A four-port C-/Ku-band prime focus feed system

The Receive Subsystem includes:

- Two Andrew ASR300 Video Receivers
- Two C-band 85K and 2 Ku-band 225K Low Noise Block Downconverters
- A CRT Console with 50 ft (15.2 m) of interface cable
- Four 50 ft (15.2 m) runs of HELIAX® cable
- An Audio/Video Patch Panel
- Integration Materials, equipment rack, cable and connectors

The Earth Station System Controller enables:

- Antenna azimuth, elevation and polarization control/monitoring
- Angular axis resolution to 0.01°
- Forty programmable satellite positions
- Programmable satellite names
- Programmable timed events
- Receiver channel tuning (1 MHz resolution)
- Audio subcarrier tuning (10 KHz resolution)
- Receiver fault/alarm monitoring
- Full- or half-transponder IF bandwidth selection
- C- or Ku-band selection

Support Services

Andrew provides the following services for the 4.5-metre C- and Ku-band video receive systems:

- Systems Engineering
- Program Management
- Factory Integration

- Factory Performance Testing
- Antenna Installation
- RF Subsystem Installation
- System Testing
- Shipping and Delivery
- Documentation
- Operator Training

System Options

- An Audio/Video Routing Switcher
- A Printer
- Antenna anti-icing system
- Additional ASR300 Video Receivers

Andrew can also provide video systems incorporating:

- 3.7-, 4.6-, 5.6- and 6.8-metre Ku-band earth station antennas
- 4.5-, 7.3- and 9.1-metre C-band earth station antennas

Andrew is fully equipped to provide complete uplink systems for C- or Ku-band operation.

Transmit/Receive Systems

The operational configurations of a transmit/receive earth station system will vary widely depending upon the specific application. Andrew's experienced system engineers will design a transmit system to meet the specified requirements for a variety of applications including:

- Broadcast Video Distribution Networks
- Broadcast Radio System Networks
- Data Communications Networks
- Voice/Data System Networks

A wide range of system component configurations are available for fully-redundant or phase-combined transmit subsystems featuring total availability or single thread uplink systems for occasional transmissions. Each Andrew system is designed for maximum performance and optimum cost-efficiency. Available systems and system components include:

- Digital Hub Mounted Electronics for Andrew 3.7-, 4.6-, 5.6- and 6.8-metre Ku-band antennas
- 1.8-metre offset Very Small Aperature Terminal (VSAT) for voice and digital stations
- STAR Network Hub Stations
- Single Thread or Redundant Video Stations
- Time Division Multiple Access (TDMA) Transmit/ Receive System Networks
- Single Channel Per Carrier (SCPC) Terminals and Networks

Superior performance is achieved utilizing a STAR Network system which typically utilizes a 5.6-metre earth station antenna at the main hub with an array of 3.7-metre antennas at the corresponding remote sites. A 4.6- or 6.8-metre antenna may also be used at the main hub site with 1.8-, 2.4- or 3-metre earth station antennas comprising the network array. Interconnected Mesh networks can also be designed, eliminating the need for a single hub site terminal. Networks are ideal for business systems requiring point of sale terminals for inventory control, voice or other data communications.

Andrew can design system networks with transmit stations based on VSAT, SCPC or TDMA technologies.

Mobile Transmit/Receive Video Satellite Systems

Andrew offers electronic system products to complement the ESA23VM 2.3-metre prime focus offset feed antenna providing a complete integrated package for use in mobile transmit/receive systems. The ESA23VM mobile transmit/receive system is particularly suited for television broadcast industry satellite news gathering applications.

The following major system component assemblies are available:

2.3-Metre RF Assembly – Andrew provides assembly, installation and testing in a customer-furnished vehicle of a variety of transmit/receive configurations for the ESA23VM offset antenna. The RF assembly consists of a mounting panel containing transmit component configurations such as Traveling Wave Tube Amplifiers (TWTA's), combining networks, waveguide switches and custom waveguide interconnect assemblies. The panel also contains provisions for mounting receive electronics such as Low Noise Amplifiers (LNA's), Low Noise Converters (LNC's), transmit reject filters, and interconnecting waveguide and cable.

Included with the assembly are a video exciter and the TWTA Power Supply. Each is designed to be remotely mounted from the antenna, usually inside the vehicle cab or van box. Redundant configurations of all components are available.

2.3-Metre Voice/Data Assembly – Andrew can include a voice and data communications system between mobile and fixed earth stations. This assembly is comprised of a modular package designed to directly integrate into the 2.3-metre RF assembly. The product offers a minimum system configuration of one full-duplex voice channel, one simplex voice channel and one duplex data channel. Various voice/data equipment configurations are available to meet specific system requirements.

For additional information regarding Andrew earth station systems or system components, contact your local Andrew Sales Office.

ASR300 Satellite Video Receiver

Features:

- **Superior Performance**
  Exceeds EIA Standard RS250B
- **Dual-Band Operation**
  Both C- and Ku-Band Reception Using Appropriate LNC Networks
- **Advanced Technology**
  Microprocessor Controlled and Frequency Synthesized
- **Ease of Operation**
  Keypad Entry Initiates All Control Functions
  Convenient Front Panel Access to Signal Metering, Output Level Adjustments and Alarm Indicators
- **Remote Control Interface**
  Fully Operational from a Remote Location
- **Internal Fault Monitoring Subsystems**
  Alarm Circuitry Signifies Loss of Carrier, Video Signal and/or Power Supply Malfunctions
- **Dual IF Filters**
  Selectable IF Filter Switching Enables Dual Bandwidth Operation
- **Three Audio Subcarrier Demodulators**
  Provides Required Flexibility for Various Audio/Digital Services
- **Operational Compatibility**
  Functional with Most LNC's Operating in the 950-1450 MHz Band

The Andrew ASR300 satellite video receiver combines advanced technology with extreme flexibility to ensure the extended reliability and versatility required for continuous commercial operational requirements. The receiver incorporates ease of operation with microprocessor based technology for superior system performance characteristics.

The ASR300 provides frequency synthesized receiver tuning in 1 MHz increments. The receiver wideband demodulator enables broadcast quality performance with video FM peak deviations of up to 13.8 MHz, while receiver AFC circuitry compensates for any frequency drifting of the LNC's. Receiver input switching permits attachment of two LNC's for single band/dual polarity or dual band/single polarity operation.

Factory installed IF filter networks are available with selectable bandwidth ranges from 17.5 to 36 MHz. Electronic IF filter switching is easily performed from the receiver front panel or via a remotely controlled interface. The receiver utilizes dual video adjust which allows a preset video output level for each IF filter. This feature maintains the same video output level for two distinctly different video FM deviation signals.

A clamped composite baseband output and two buffered video outputs are provided. Receiver compatibility with most transmission security systems is achieved via a composite output clamping control (enable/disable) and video polarity control.

A front panel displayed fault monitoring system visually alerts the operator to video loss via internal video detection circuitry, carrier loss via AGC monitoring circuitry and/or power supply failure via output monitoring circuitry. A summary alarm indication is also provided in addition to all other alarm signals via the remote interface.

Electrical Specifications

RF	
Frequency Range	950-1450 MHz
Synthesizer Tuning Resolution	1 MHz
Input Level	–65 dBm minimum
Input Impedance	75 ohm, F connector
Return Loss	14 dB minimum
Noise Figure	15 dB maximum

IF	
IF Bandwidth (MHz)	Select two: 36, 30, 27, 24, 17.5

Video (@ 10.7 MHz peak deviation)	
Output Level	1 v p-p ±0.5 dB
Frequency Response	10 Hz – 4.2 MHz ±0.5 dB
Output Impedance	75 ohm, BNC connector
Return Loss	26 dB minimum
Differential Phase	±0.75° (IF BW) 27 MHz, 10-90 APL
Differential Gain	±2% (IF BW) 27 MHz, 10-90 APL
Chrom/Lum Delay Ineq	±26 ns
Chrom/Lum Gain Ineq	±4 IRE p-p

Audio	
Subcarriers	Two fixed tuned, one agile
Subcarrier Frequency	5.0-8.0 MHz
Frequency Range	±0.5 dB, 50 Hz-15 KHz
Output Impedance	600 ohms, balanced
Output Level	+18 dBm, maximum (terminated)
De-emphasis	75 us
Harmonic Distortion	1%
Subcarrier Pre-Detection Filter	400 KHz, fixed subcarriers 280 KHz, tunable subcarrier Additional combinations are available upon request

Remote Control	
Parallel	TTL interface
Serial (optional)	RS422 interface

General	
Dimensions, in (mm)	3.5 H x 17 W x 13 D (89 x 432 x 330)
Power Requirements	115/230VAC; 50/60 Hz

Introduction

TRASAR television broadcast transmitting antennas combine a traveling wave, slotted radiator with a cylindrical radome to yield the highest levels of performance and reliability in the industry. All TRASAR antennas provide excellent near-in coverage, while maintaining desired gain. The Andrew design simultaneously optimizes gain, half-power beamwidth and null fill to provide unequalled aperture efficiency.

The TRASAR antenna design permits very close azimuth pattern control. Pattern circularity of omni-directional antennas is typically within ±1.0 dB.

Elevation patterns are shaped by controlling the phase and amplitude of power distributed to each element of the array. The cosecant squared pattern, which provides uniform signal strength to both near and distant locations, is very closely approximated. Beam tilt is achieved without loss in gain.

The unique Andrew traveling wave antenna design eliminates the need for complicated feed harnesses (which are prone to failure and require routine maintenance) to achieve outstanding reliability.

Antenna Interaction Studies

Andrew offers the service to perform custom studies to analyze the interaction between two or more television transmitting antennas in close proximity. These studies consist of theoretical computer synthesis of the pattern effects. The results are confirmed by making actual measurements of antenna models in an anechoic chamber.

Standard Performance Features

The variety of standard TRASAR antenna patterns allows the user to select a combination of features without the need for custom designing.

Guaranteed Performance

During manufacture, TRASAR antennas undergo numerous radiation pattern measurements to ensure compliance with stated electrical performance characteristics. In addition, mechanical structural integrity is inspected and certified to ensure a quality product.

Available Models

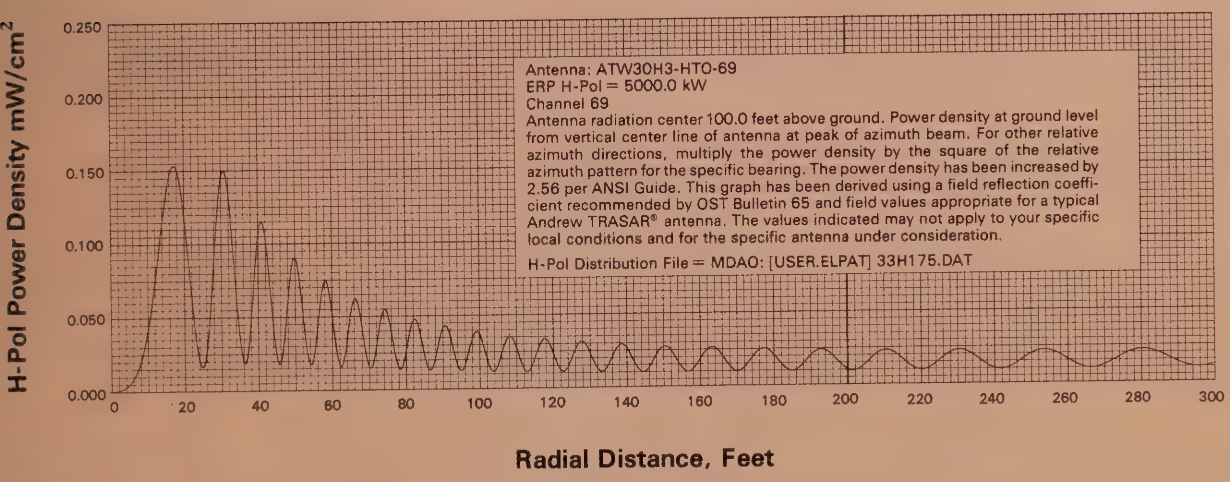
TRASAR high power transmitting antennas are available for both VHF-TV and UHF-TV applications with horizontal and circular polarizations. Top and side mount configurations, a variety of radiation patterns and other options are available. Andrew's product line of high power antennas is summarized on pages 134-137. For further details, contact your local Andrew Sales Office listed inside the back cover and request the referenced bulletins. Custom designed antennas are also offered with vertical and horizontal patterns tailored specifically to individual requirements.

Antennas for medium and lower power applications are presented on pages 138-141.

Typical Systems are illustrated on pages 32-37.

Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation. Independently verified computer analyses of actual TRASAR antenna near-field radiation levels, including reflected fields, as prescribed by the OST Bulletin 65 have been performed. Predicted near-field power densities using actual performance data for TRASAR traveling wave slotted array antennas are much lower than levels obtained using FCC recommended OST standardized calculation methods. This is due to the superior radiation characteristics of the TRASAR antennas. The graph below shows "typical average power density vs. radial distance" for a Channel 69 ATW30H series antenna radiating 5000 kW ERP as predicted at ground level 100 feet (30 m) below the antenna radiation center.

Typical Average Power Density on Ground Level vs Radial Distance



TRASAR® High Power Transmitting Antennas for VHF-TV (V-Series)

TRASAR high power VHF-TV transmitting antennas are available with horizontal or circular polarization for U.S. FCC channels 7 through 13 and channels in CCIR band III.

VHF-TV Horizontally Polarized Top and Side Mount Transmitting Antennas

Specifications

Channel Range:	7-13, one channel (170-230 MHz)
VSWR:	1.05 Visual + 0.5 MHz 1.08 Color Sub-Carrier 1.10 Remainder of Channel
Deicing:	Radome Enclosed, Unpressurized
Radome:	Fiberglass 22.4" Dia.
Input Power:	100kW Peak Visual +20% Aural
Input Type:	Specify 50 or 75 ohm 6-1/8" EIA

Electrical Characteristics

Radiation Patterns. Omnidirectional, skull and horizontally-polarized peanut patterns are available for top or side mount installations. All patterns are available in a variety of gain configurations. Standard beam tilt is 0.75° with other beam tilts available on request. Omnidirectional patterns are generally not recommended for side-mounted applications because of the potential degradation of the pattern produced by reflections from the supporting structure. Andrew can, however, perform a study of the tower/antenna interaction to recommend a mounting configuration that will minimize pattern degradation in primary coverage areas.

Power Rating. A simple, high power center feed system excites the

Electrical Characteristics

Antenna Type Number	Horizontal Polarized Peak Power Gain (dBd)	Horizontal Polarized Gain at Horizontal (dBd)
Omnidirectional (±1 dB)	**RMS Gain**	
ATW6V3-HTO/HSO-(*)	6.0 (7.78)	5.76 (7.60)
ATW9V3-HTO/HSO-(*)	9.0 (9.45)	8.64 (9.37)
ATW12V3-HTO/HSO-(*)	12.0 (10.79)	10.83 (10.35)
Skull	**Peak Gain**	
ATW6V3-HTS/HSS-(*)	11.40 (10.57)	10.95 (10.39)
ATW9V3-HTS/HSS-(*)	17.10 (12.33)	16.42 (12.15)
ATW12V3-HTS/HSS-(*)	22.80 (13.58)	20.58 (13.13)
Peanut	**Peak Gain**	
ATW6V3-HTP-(*)	12.30 (10.89)	11.81 (10.72)
ATW9V3-HTP-(*)	18.45 (12.66)	17.72 (12.48)
ATW12V3-HTP-(*)	24.60 (13.90)	22.20 (13.46)

*Insert channel number.

Mechanical Characteristics

Antenna Type Number	Channel Number‡	Antenna Height† ft (m)	Radiation Center Above Base ft (m)	Nominal Top Mount Weight lb (kg)	Nominal Side Mount Weight lb (kg)	Windload** (Shear) lb (N)	Overturning** Moment (Top Mount Only) ft-lb (N-m)
ATW6V3 Series	7	38.11 (11.62)	19.05 (5.81)	5525 (2506)	4600 (2086)	2679 (11917)	56333 (76377)
	13	31.67 (9.65)	15.83 (4.82)	4735 (2148)	3883 (1761)	2245 (9986)	39577 (53659)
ATW9V3 Series	7	54.45 (16.60)	27.22 (8.30)	7531 (3116)	6523 (2959)	3778 (16805)	112166 (152076)
	13	45.25 (13.79)	22.62 (6.89)	6401 (2903)	5500 (2495)	3159 (14052)	78388 (106280)
ATW12V3 Series	7	70.79 (21.58)	35.39 (10.79)	9573 (4326)	8341 (3783)	4878 (21698)	187405 (254087)
	13	58.82 (17.93)	29.41 (8.96)	8068 (3660)	7010 (3180)	4072 (18113)	130343 (176721)

**Based on wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C.

†Total height excluding 3 ft (1 m) lightning protection.
‡Representative. Complete data available in Bulletin 1359A.

TRASAR antenna. The limiting factor for power rating is the rating of the input transmission line flange. The feed does not use power dividers, junction boxes or branch feed lines.

VHF-TV Circular Polarized Top and Side Mount Transmitting Antennas

Specifications

Channel Range:	7-13, one channel (170-230 MHz)
VSWR:	1.05 Visual + 0.5 MHz 1.08 Color Sub-Carrier 1.10 Remainder of Channel
Axial Ratio:	2 dB Omni, ±90° Skull
Deicing:	Radome Enclosed, Unpressurized
Radome:	Fiberglass 22.4"/32.4" Diameter
Input Power:	100kW, Peak Visual +20% Aural
Input Type:	Specify 50 or 75 ohm 6-1/8" EIA

Power Gain specifications are based on antenna directivity as defined by the entire vertical and horizontal patterns less all antenna losses, including internal loss, feed system loss, cross-polarization loss and radome effect. During final factory tests, each antenna is measured, using computer aided techniques, to confirm specified gain and pattern characteristics.

VSWR. The input VSWR of the TRASAR antenna is very low. No external fine tuning or matching devices are required to optimize VSWR. Direct slotted line data, measured at the input flange, is used for factory VSWR optimization and field VSWR verification.

Mechanical Characteristics

Mounting. Free-standing top-mounted and side-mounted versions of the TRASAR antennas are offered. The side-mounted antenna is lighter and uses the tower as its supporting member. The side-mounted antenna requires less rigidity and mechanical strength, resulting in a less costly and lighter antenna and tower structure. Because of tower reflections, the side-mounted antenna is not recommended for omnidirectional applications.

The top-mounted antenna is self-supporting and attaches directly to the top plate of the tower. Its supporting structure is a seamless, thick-wall, galvanized steel tube which functions as a transmission line and slotted radiating cylinder.

Radomes. A rugged segmented fiberglass radome eliminates problems caused by ice formation on radiating elements.

The radome's smooth gel-coated surface resists ice adhesion and build up. Users located in heavy icing areas have not found the need for deicing equipment. An optional hydrophobic coating is available to enhance the inherent water and ice shedding properties of the fiberglass radome in severe climates.

Windloading. Because the TRASAR antenna is enclosed in a cylindrical radome, windloading is low. The lower overturning moment and shear force can result in significantly lower tower costs.

Additional Information

For radiation patterns and other detailed information, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1359A.

Electrical Characteristics

Antenna Type Number	Circular Polarized Power Gain (dBd) (Per Polarization)	Circular Polarized Gain at Horizontal (dBd) (Per Polarization)
Omnidirectional (±1 dB)	**RMS Gain**	
ATW9V3-CTO-(*)	4.5 (6.53)	4.32 (6.36)
ATW12V3-CTO-(*)	6.0 (7.78)	5.42 (7.34)
ATW16V3-CTO-(*)	8.0 (9.03)	6.92 (8.40)
Skull	**Peak Gain**	
ATW9V3-CTS/CSS-(*)	8.55 (9.32)	8.21 (9.14)
ATW12V3-CTS/CSS-(*)	11.40 (10.57)	10.29 (10.12)
ATW16V3-CTS/CSS-(*)	15.20 (11.82)	13.15 (11.19)

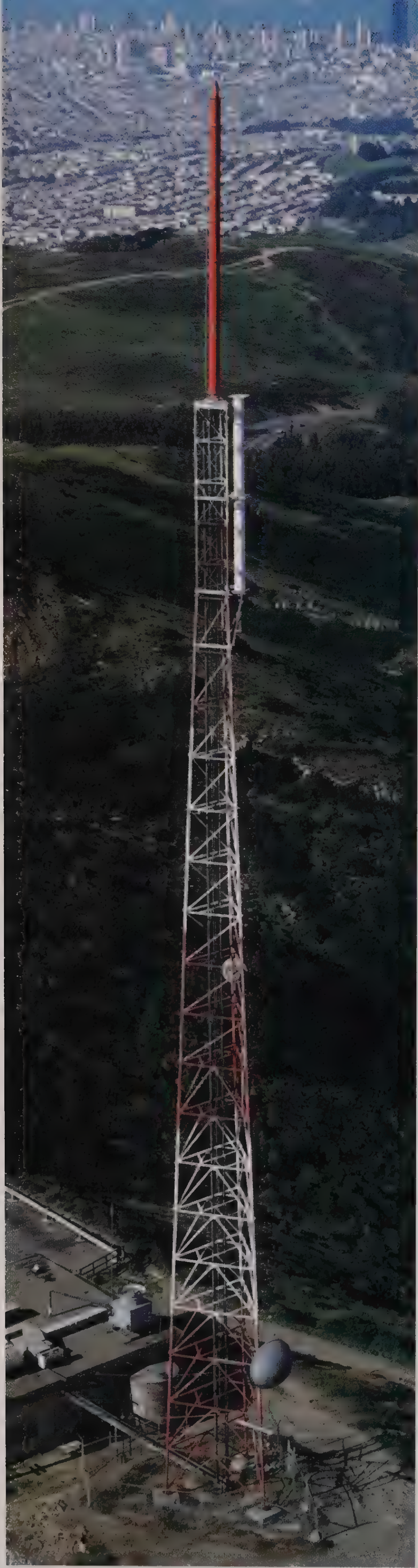
*Insert channel number.

Mechanical Characteristics

Antenna Type Number	Channel Number‡	Antenna† Height ft (m)	Radiation Center Above Base ft (m)	Nominal Top Mount Weight lb (kg)	Nominal Side Mount Weight lb (kg)	Windload** (Shear) lb (N)	Overturning** Moment (Top Mount Only) ft-lb (N-m)
ATW9V3 Series	7	54.45 (16.60)	27.22 (8.30)	7610 (3452)	6707 (3042)	4435 (19728)	126107 (170978)
	13	45.25 (13.79)	22.62 (6.89)	6455 (2928)	5659 (2567)	3711 (16507)	88173 (119545)
ATW12V3 Series	7	70.79 (21.58)	35.39 (10.79)	9678 (4390)	8587 (3895)	5756 (25604)	210800 (285806)
	13	58.82 (17.93)	29.41 (8.96)	8175 (3708)	7222 (3276)	4810 (21396)	147020 (199332)
ATW16V3 Series	7	92.57 (28.21)	46.28 (14.11)	22744 (10316)	11200 (5080)	7517 (33437)	357301 (484435)
	13	76.92 (23.44)	38.46 (11.72)	12508 (5673)	9306 (4221)	6279 (27930)	248726 (337227)

**Based on wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C.

†Total height excluding 3 ft (1 m) lightning protection.
‡Representative. Complete data available in Bulletin 1359A.



TRASAR® High Power Transmitting Antennas for UHF-TV (H-Series)

TRASAR high power UHF-TV transmitting antennas are available with horizontal polarization, circular polarization, dual polarization and partial vertical polarization for U.S. FCC channels 14 through 69 and CCIR bands IV and V.

Electrical Characteristics

Radiation Patterns. Omnidirectional, cardioid, peanut and tri-lobe patterns are standard for top-mounted antennas. Cardioid, peanut and tri-lobe patterns are standard for side-mounted antennas. All patterns are available in high and medium gain configurations. Optional elevation beam tilts are 0.5, 0.75, 1.00 and 1.25 degrees. All antennas have high first null fill. Numerous special directional patterns are available for side-mounted antennas. Omnidirectional patterns are not generally recommended for side-mounted applications because of the potential degradation of the pattern produced by reflections from the supporting structure. Andrew can, however, perform a study of the tower-antenna interaction to recommend a mounting configuration that will minimize pattern degradation in primary coverage areas.

Power Gain specifications are based on antenna directivity as defined by the entire vertical and horizontal patterns less all antenna losses, including internal loss, feed system loss, vertical polarization loss and radome effect. During final factory tests, each antenna is measured using computer aided techniques to confirm specified gain and pattern characteristics.

Input power ratings for typical TRASAR antennas are specified in the tables. Field tests have demonstrated that each layer of omnidirectional slots is capable of handling more than 100 kW of power. Basic design criteria allows a conservative 10 kW of power rating for each layer, thus providing a safety factor of ten to one. The limiting factor for power rating of the TRASAR antenna is the rating of the input transmission line fitting.

VSWR. The input VSWR of the TRASAR antenna is very low. External line matchers are not required.

Frequency	Max VSWR	Typical VSWR
Visual Carrier to ±0.5 MHz	1.05	1.02
Chrominance Subcarrier	1.08	1.04
Remainder of Channel	1.10	1.05

Input. TRASAR antennas are available with 3-1/8" to 9" coaxial or WR1150 to WR1800 waveguide connections, depending on the system application.

Mechanical Characteristics

Mounting. Andrew offers both free-standing, top-mounted and side-mounted versions of the TRASAR antenna. The side-mounted antenna uses the tower as its supporting member. Compared with the top-mounted antenna, it requires less rigidity and mechanical strength, resulting in a less costly and approximately 60% lighter antenna structure.

The top-mounted antenna is self-supporting and attaches directly to the top plate of the tower. Its supporting structure is a galvanized, seam-less, thick-wall steel tube which functions as a transmission line and slot radiator.

Radome. A rugged pressurized fiberglass radome surrounds the entire radiating surface of these TRASAR antennas and eliminates problems caused by corrosion and by ice formation on the radiating slots. The radome's smooth vertical surfaces resist ice adhesion and build up. Users located in heavy icing areas have not found the need for deicing equipment.

Wind Loading. Because the antenna is enclosed in a cylindrical radome, windloading is very low compared with other antenna types. The low over-turning moment and shear force for the Andrew unit can result in significantly lower tower costs.

Additional Information. For information on radiation patterns and detailed mechanical data, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1083K.

UHF-TV Horizontally Polarized Transmitting Antennas – Electrical Characteristics

Medium or High Gain	Azimuth Pattern	Antenna Type Number	Peak Power Gain	Input Power, kW (dBK) Ch 14	Ch 69
Side Mounted Antennas					
Medium	Cardioid	ATW25H(*)-HSC-(**)	47.00 (16.72 dB)	80 (19.03)†	56 (17.48)†
	Peanut	ATW25H(*)-HSP-(**)	54.75 (17.38 dB)	80 (19.03)†	56 (17.48)†
	Narrow Peanut	ATW25H(*)-HSN-(**)	80.00 (19.03 dB)	80 (19.03)†	56 (17.48)†
	Tri-Lobe	ATW25H(*)-HST-(**)	50.00 (16.99 dB)	80 (19.03)†	56 (17.48)†
High	Cardioid	ATW30H(*)-HSC-(**)	56.40 (17.51 dB)	80 (19.03)†	56 (17.48)†
	Peanut	ATW30H(*)-HSP-(**)	65.70 (18.18 dB)	80 (19.03)†	56 (17.48)†
	Narrow Peanut	ATW30H(*)-HSN-(**)	96.00 (19.82 dB)	80 (19.03)†	56 (17.48)†
	Tri-Lobe	ATW30H(*)-HST-(**)	60.00 (17.78 dB)	80 (19.03)†	56 (17.48)†
Top Mounted Antennas					
Medium	Omni	ATW25H(*)-HTO-(**)	25.00 (13.98 dB)	136 (21.34)	110 (20.41)
	Cardioid	ATW25H(*)-HTC-(**)	52.25 (17.78 dB)	136 (21.34)	110 (20.41)
	Peanut	ATW25H(*)-HTP-(**)	61.00 (17.85 dB)	136 (21.34)	110 (20.41)
	Tri-Lobe	ATW25H(*)-HTT-(**)	44.50 (16.48 dB)	136 (21.34)	110 (20.41)
High	Omni	ATW30H(*)-HTO-(**)	30.00 (14.77 dB)	136 (21.34)	110 (20.41)
	Cardioid	ATW30H(*)-HTC-(**)	62.70 (17.97 dB)	136 (21.34)	110 (20.41)
	Peanut	ATW30H(*)-HTP-(**)	73.20 (18.65 dB)	136 (21.34)	110 (20.41)
	Tri-Lobe	ATW30H(*)-HTT-(**)	53.40 (17.27 dB)	136 (21.34)	110 (20.41)

*Beamtilt	Specify
0.50°	2
0.75°	3
1.00°	4
1.25°	5

**Specify UHF-TV Channel Number
†An optional High-Power input is available for side-mounted antennas.

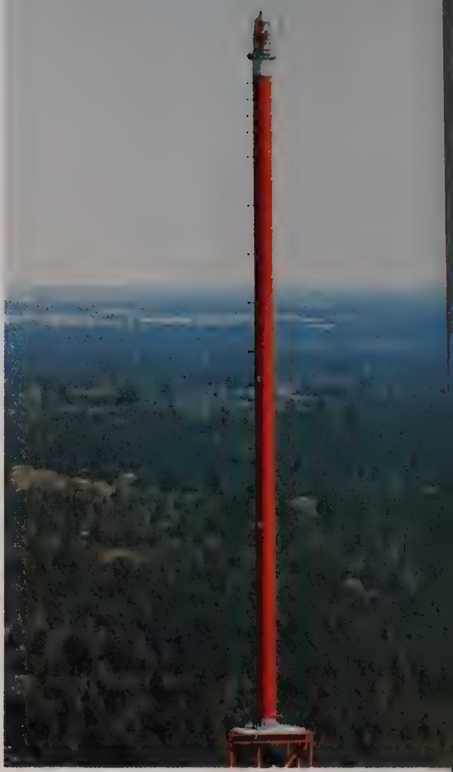
UHF-TV Circular and Dual Polarized Transmitting Antennas – Electrical Characteristics

Antenna Type	Azimuth Pattern	Peak Power Gain	Input Power Ratio Per Polarization	Input Power, kW (dBK)‡ Ch 14	Ch 69
ATW30H(*)-DSC-(**) Cardioid Side Mount					
H-Pol.	66VALAZHP	56.40 (17.71 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	66VALAZVP	56.70 (17.54 dBd)	†	136 (21.34)	110 (20.41)
ATW30H(*)-DSP-(**) Broad Peanut Side Mount					
H-Pol.	AZ1121	60.30 (17.80 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	AZ1122	60.75 (17.84 dBd)	†	136 (21.34)	110 (20.41)
ATW30H(*)-DSN-(**) Narrow Peanut Side Mount					
H-Pol.	AZ035A	60.00 (17.78 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	CH35VF8885	83.70 (19.23 dBd)	†	136 (21.34)	110 (20.41)
ATW30H(*)-DTO-(**) Omnidirectional Top Mount					
H-Pol.	045516H	30.00 (14.77 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	045516V	27.00 (14.31 dBd)	†	(240 kW optional)	
ATW30H(*)-DTC-(**) Cardioid Top Mount					
H-Pol.	AZ2033	57.90 (17.63 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	AZ2034	57.24 (17.58 dBd)	†	(240 kW optional)	
ATW30H(*)-DTP-(**) Peanut Top Mount					
H-Pol.	AZ1049	72.60 (18.61 dBd)	†	136 (21.34)	110 (20.41)
V-Pol.	AZ1071	50.22 (17.01 dBd)	†	(240 kW optional)	

*Beamtilt	Specify
0.50°	2
0.75°	3
1.00°	4
1.25°	5

**Specify UHF-TV Channel Number
†Specify power split.
‡8-3/16", 75 ohm up to channel 49, WR1150 channel 50 and above, WR1500 for optional 240 kW max. power models.

TRASAR® Top-Mount, Medium Power Antennas for UHF-TV (S-Series)



TRASAR medium power, top-mount S-series UHF-TV transmitting antennas are listed below. The traveling-wave slotted array design produces broad elevation patterns, high reliability and dependable service. The self-supporting antenna attaches directly to a top plate on the tower.

The cylindrical fiberglass radome reduces windload. An optional hydrophobic coating is available to resist extreme icing conditions.

The antenna is available with an omnidirectional or cardioid azimuth pattern, and with 0.50, 0.75 or 1.00 degree beamtilt.

For radiation patterns and other detailed information, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1297C.

Electrical Characteristics

Antenna	Omnidirectional	Cardioid	Omnidirectional	Cardioid
Type Number	ATW25S(**)-HTO-(*)	ATW25S(**)-HTC-(*)	ATW30S(**)-HTO-(*)	ATW30S(**)-HTC-(*)
Pattern	Omni	Cardioid	Omni	Cardioid
Power Gain (dBd)	25 (13.98) RMS	59 (17.70) Peak	30 (14.77) RMS	70.80 (18.50) Peak
Power Gain at Horizontal (dBd)				
0.50° Beamtilt	19.80 (12.96)	46.73 (16.69)	21.16 (13.25)	49.95 (16.98)
0.75° Beamtilt	15.21 (11.82)	35.89 (15.55)	13.87 (11.42)	32.73 (15.15)
1.00° Beamtilt	9.92 (9.9)	23.41 (13.69)	7.5 (8.75)	17.70 (12.48)
Input Power, kW (dBK)				
Peak Visual +20% aural				
Channel 14	80 (19.03)	80 (19.03)	80 (19.03)	80 (19.03)
Channel 69	56 (17.48)	56 (17.48)	56 (17.48)	56 (17.48)
VSWR, Maximum				
Visual Carrier	1.05	1.05	1.05	1.05
Across Channel	1.10	1.10	1.10	1.10
Input Type, 75 ohm (50 ohm also available)	6-1/8″ EIA Flange	6-1/8″ EIA Flange	6-1/8″ EIA Flange	6-1/8″ EIA Flange

*Specify channel number.

**Specify 2 for 0.5° beamtilt, 3 for 0.75° beamtilt, 4 for 1.00° beamtilt.

Mechanical Characteristics

Channel‡ Number	Input Power Rating* kW (dBK)	Antenna Height** ft (m)	Radiation Center Above Base ft (m)	Antenna Weight lb (kg)	Windload (Shear)† lb (N)	Overturning Moment ft-lb (N·m)
Medium Gain (ATW25S Series)						
14	80 (19.03)	57.82 (17.62)	27.41 (8.35)	6680 (3030)	2456 (10925)	65618 (88966)
69	56 (17.48)	36.35 (11.07)	16.67 (5.08)	3500 (1588)	1365 (6072)	21898 (29690)
High Gain (ATW30S Series)						
14	80 (19.03)	70.30 (21.42)	33.65 (10.26)	8100 (3674)	2971 (13215)	97921 (132800)
69	56 (17.48)	43.70 (13.32)	20.35 (6.20)	4160 (1887)	1634 (7268)	32030 (43439)

*Peak visual plus 20% aural at 40°C (104°F). 6-1/8″, 75 ohm EIA flange.
**Total height including 3 ft (1 m) lightning protection.

†Based on wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces, and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C.
‡Representative. Complete data available in Bulletin 1297C.

TRASAR® Side-Mount, Medium Power Antennas for UHF-TV (G-Series)

TRASAR medium power, side-mount G-series UHF-TV transmitting antennas listed below are suitable for applications ranging from primary antenna use to emergency and stand-by installations. The traveling-wave slotted array design produces broad elevation patterns, high reliability and dependable service. All antennas feature a skull azimuth pattern.

The cylindrical fiberglass radome reduces windload. An optional hydrophobic coating is available to resist extreme icing conditions.

For radiation patterns and other detailed information, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1351A.

Electrical Characteristics

Type Number	ATW2G1-HSS-(*)	ATW8G4-HSS-(*)	ATW16G3-HSS-(*)	ATW24G(**)-HSS-(*)	ATW30G(**)-HSS-(*)
Pattern	Skull	Skull	Skull	Skull	Skull
Peak Power Gain (dBd)	4 (6.02)	16 (12.04)	32 (15.05)	48 (16.81)	60 (17.78)
Power Gain at Horizontal (dBd)					
no beamtilt	4.00 (6.02)	—	—	—	—
0.50° beamtilt	—	—	—	—	47.52 (16.77)
0.75° beamtilt	—	—	26.5 (14.23)	33.8 (15.29)	34.65 (15.39)
1.00° beamtilt	—	14.74 (11.68)	—	26.28 (14.19)	17.49 (12.42)
1.25° beamtilt	—	—	—	—	13.82 (11.40)
1.50° beamtilt	—	—	—	—	3.17 (5.01)
Input Power, kW (dBK)					
Peak Visual +20% aural					
Channel 14	80 (19.03)	80 (19.03)	80 (19.03)	80 (19.03)	80 (19.03)
Channel 69	56 (17.48)	56 (17.48)	56 (17.48)	56 (17.48)	56 (17.48)
VSWR, Maximum					
Visual Carrier	1.05	1.05	1.05	1.05	1.05
Across channel	1.10	1.10	1.10	1.10	1.10
Input Type, 75 ohm (50 ohm also available)	6-1/8″ EIA	6-1/8″ EIA	6-1/8″ EIA	6-1/8″ EIA	6-1/8″ EIA

*Specify channel number. **Specify 2 for 0.5° beamtilt; 3 for 0.75° beamtilt; 4 for 1.00° beamtilt; 5 for 1.25° beamtilt; 6 for 1.50° beamtilt.

Mechanical Characteristics

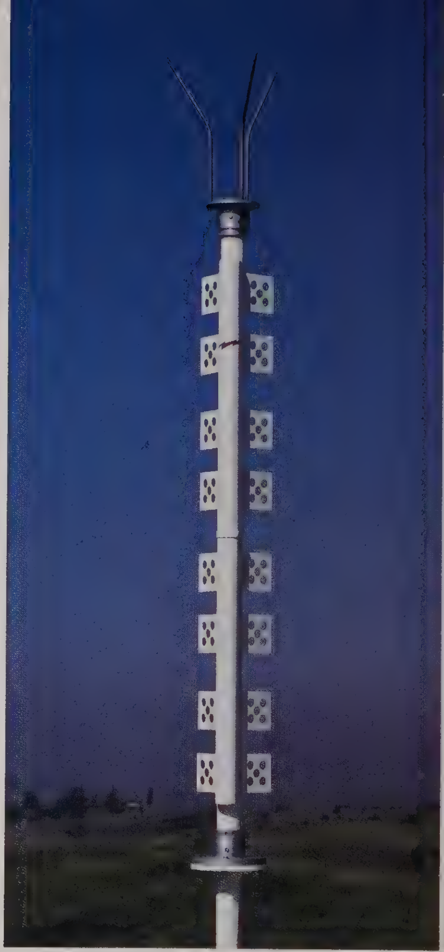
Ch. †	Antenna Height Incl. Lightning Rods, ft (m)	Radiation Center Above Base ft (m)	Windload (Shear)* lb (N)	Antenna Weight lb (kg)
ATW2G Series				
14	8.1 (2.5)	2.5 (0.8)	200 (890)	255 (116)
69	8.1 (2.5)	2.5 (0.8)	200 (890)	255 (116)
ATW8G Series				
14	20.6 (6.3)	8.8 (2.7)	634 (2820)	475 (215)
69	14.4 (4.4)	5.7 (1.7)	414 (1841)	384 (174)
ATW16G Series				
14	36.7 (11.2)	16.9 (5.1)	1218 (5418)	766 (347)
69	24.0 (7.3)	10.5 (3.2)	757 (3367)	577 (262)

Ch. †	Antenna Height Incl. Lightning Rods, ft (m)	Radiation Center Above Base ft (m)	Windload (Shear)* lb (N)	Antenna Weight lb (kg)
ATW24 Series				
	52.9 (16.1)	25.0 (7.6)	1803 (8020)	1058 (480)
	33.5 (10.2)	15.2 (4.6)	1101 (4897)	771 (350)
ATW30 Series				
	69.1 (21.1)	33.0 (10.1)	2388 (10622)	1350 (612)
	43.0 (13.1)	20.0 (6.1)	1444 (6423)	946 (429)

*Based on wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces, and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C.

† Representative. Complete data available in Bulletin 1351A.

TRASAR® Low and Intermediate Power Antennas for UHF-TV (L-Series)



TRASAR low and intermediate power television transmitting antennas offer a combination of quality, reliability, performance and economy. The construction is aluminum so that the antenna is highly weather resistant, light in weight and easy to install. A radome provides environmental protection for the radiating elements. An optional hydrophobic coating is available for extreme icing conditions. Radiation patterns for all antennas listed in the table are on file with the U.S. FCC.

Modular Design

The antennas incorporate a versatile modular design. The basic module has 4 bays with an omnidirectional pattern. The same module is used for 4 or 8 bay top mount, as well as 4, 8, 12, 16, 24 and 32 bay side mount applications using a pressurized coaxial power divider feed system.

During manufacture, TRASAR antennas undergo numerous radiation pattern measurements to ensure compliance with stated electrical performance characteristics. In addition, mechanical structural integrity is inspected to ensure a quality product.

Additional Information

For radiation patterns and other detailed information, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1313B.

Low and Intermediate Power Transmitting Antennas - Electrical Characteristics

Azimuth Pattern	Number of Bays	Antenna Type Number	Power Gain (dBd)	VSWR Max.	Input Power Watts	Input Type
Omnidirectional RMS Gain ±2.0 dB	4	ATW4L1-HSO/HTO-(*)	4.36 (6.39)	1.1	2500	7/8" EIA, 50 ohm
	8	ATW8L1-HSO/HTO-(*)	8.89 (9.49)	1.1	5000	1-5/8" EIA, 50 ohm
	12	ATW12L2-HSO-(*)	12.0 (10.78)	1.1	7500	1-5/8" EIA, 50 ohm
	16	ATW16L2-HSO-(*)	16.0 (12.04)	1.1	10000	1-5/8" EIA, 50 ohm
	24	ATW24L3-HSO-(*)	24.0 (13.80)	1.1	15000	3-1/8" EIA, 50 ohm
	32	ATW30L3-HSO-(*)	30.0 (14.77)	1.1	20000	3-1/8" EIA, 50 ohm
Broad Cardioid (Azimuth Pattern AZ-1002) 1.86 (2.7 dB) Directivity	4	ATW4L1-HSB/HTB-(*)	8.11 (9.09)	1.1	2500	7/8" EIA, 50 ohm
	8	ATW8L1-HSB/HTB-(*)	16.54 (12.19)	1.1	5000	1-5/8" EIA, 50 ohm
	12	ATW12L2-HSB-(*)	22.3 (13.48)	1.1	7500	1-5/8" EIA, 50 ohm
	16	ATW16L2-HSB-(*)	29.75 (14.74)	1.1	10000	1-5/8" EIA, 50 ohm
	24	ATW24L3-HSB-(*)	44.64 (16.49)	1.1	15000	3-1/8" EIA, 50 ohm
	32	ATW30L3-HSB-(*)	55.8 (17.46)	1.1	20000	3-1/8" EIA, 50 ohm
Peanut (Azimuth Pattern AZ-0890) 1.88 (2.74 dB) Directivity	4	ATW4L1-HSP/HTP-(*)	8.2 (9.13)	1.1	2500	7/8" EIA, 50 ohm
	8	ATW8L1-HSP/HTP-(*)	16.71 (12.23)	1.1	5000	1-5/8" EIA, 50 ohm
	12	ATW12L2-HSP-(*)	22.56 (13.53)	1.1	7500	1-5/8" EIA, 50 ohm
	16	ATW16L2-HSP-(*)	30.1 (14.78)	1.1	10000	1-5/8" EIA, 50 ohm
	24	ATW24L3-HSP-(*)	45.12 (16.54)	1.1	15000	3-1/8" EIA, 50 ohm
	32	ATW30L3-HSP-(*)	56.4 (17.51)	1.1	20000	3-1/8" EIA, 50 ohm
Narrow Cardioid (Azimuth Pattern AZ-0892) 3.77 (5.76 dB) Directivity	4	ATW4L1-HSN/HTN-(*)	16.43 (12.15)	1.1	2500	7/8" EIA, 50 ohm
	8	ATW8L1-HSN/HTN-(*)	33.51 (15.25)	1.1	5000	1-5/8" EIA, 50 ohm
	12	ATW12L2-HSN-(*)	45.24 (16.55)	1.1	7500	1-5/8" EIA, 50 ohm
	16	ATW16L2-HSN-(*)	60.32 (17.80)	1.1	10000	1-5/8" EIA, 50 ohm
	24	ATW24L3-HSN-(*)	90.48 (19.56)	1.1	15000	3-1/8" EIA, 50 ohm
	32	ATW30L3-HSN-(*)	113.1 (10.53)	1.1	20000	3-1/8" EIA, 50 ohm

*Specify channel number.

UHF-TV Low and Intermediate Power Transmitting Antennas - Mechanical Characteristics

Channel Number	Number of Bays	Diameter in (mm)	Height* ft (m)	Weight Side Mt. lb (kg)	Weight Top Mt. lb (kg)	Windload Shear** Omni lb (N)	Windload Shear** Directional lb (N)	Overturning Moment** Omni ft-lb (N-m)	Overturning Moment** Directional ft-lb (N-m)
14-24	4	3.5 (89)	10.0 (30)	87 (39)	48.5 (22)	123 (547)	184 (818)	652 (884)	955 (1295)
25-30	4	3.5 (89)	9.5 (29)	84 (38)	46.0 (21)	118 (525)	179 (796)	625 (847)	912 (1236)
31-37	4	3.5 (89)	9.0 (27)	82 (37)	44.0 (20)	113 (503)	174 (774)	601 (815)	869 (1178)
38-45	4	2.87 (73)	8.5 (26)	75 (34)	37.0 (17)	93 (414)	155 (689)	479 (649)	735 (996)
46-53	4	2.87 (73)	8.0 (24)	74 (34)	36.0 (16)	89 (396)	151 (672)	464 (629)	706 (957)
54-61	4	2.87 (73)	7.5 (23)	73 (33)	35.0 (16)	85 (378)	147 (654)	450 (610)	677 (918)
62-69	4	2.87 (73)	7.0 (21)	71 (32)	33.0 (15)	81 (360)	143 (636)	436 (591)	648 (879)
14-24	8	3.5 (89)	20.0 (61)	177 (80)	120.0 (54)	245 (1090)	368 (1637)	2457 (3331)	3681 (4991)
25-30	8	3.5 (89)	19.0 (58)	172 (78)	115.0 (52)	236 (1050)	358 (1592)	2352 (3189)	3508 (4756)
31-37	8	3.5 (89)	18.0 (55)	167 (76)	110.0 (50)	226 (1005)	348 (1548)	2256 (3059)	3335 (4522)
38-45	8	2.87 (73)	17.0 (52)	152 (69)	95.0 (43)	187 (832)	309 (1374)	1833 (2485)	2855 (3871)
46-53	8	2.87 (73)	16.0 (49)	148 (67)	90.0 (41)	179 (796)	301 (1339)	1770 (2400)	2737 (3711)
54-61	8	2.87 (73)	15.0 (46)	146 (66)	87.0 (39)	171 (761)	293 (1303)	1707 (2314)	2619 (3551)
62-69	8	2.87 (73)	14.0 (43)	143 (65)	83.0 (38)	163 (725)	285 (1268)	1644 (2229)	2501 (3391)
14-24	12	3.5 (89)	30.0 (91)	247 (112)	—	368 (1637)	552 (2455)	—	—
25-30	12	3.5 (89)	28.5 (87)	237 (107)	—	354 (1576)	537 (2389)	—	—
31-37	12	3.5 (89)	27.0 (82)	232 (105)	—	339 (1508)	523 (2326)	—	—
38-45	12	2.87 (73)	25.5 (78)	212 (96)	—	280 (1245)	464 (2064)	—	—
46-53	12	2.87 (73)	24.0 (73)	207 (94)	—	268 (1192)	452 (2010)	—	—
54-61	12	2.87 (73)	22.5 (69)	202 (92)	—	256 (1139)	440 (1957)	—	—
62-69	12	2.87 (73)	21.0 (64)	197 (89)	—	244 (1085)	428 (1904)	—	—
14-24	16	3.5 (89)	40.0 (122)	321 (146)	—	491 (2184)	736 (3274)	—	—
25-30	16	3.5 (89)	38.0 (116)	311 (141)	—	471 (2095)	716 (3185)	—	—
31-37	16	3.5 (89)	36.0 (110)	306 (139)	—	452 (2010)	697 (3100)	—	—
38-45	16	2.87 (73)	34.0 (104)	271 (123)	—	374 (1663)	619 (2753)	—	—
46-53	16	2.87 (73)	32.0 (97)	266 (121)	—	358 (1592)	603 (2682)	—	—
54-61	16	2.87 (73)	30.0 (91)	261 (118)	—	342 (1521)	587 (2611)	—	—
62-69	16	2.87 (73)	28.0 (85)	256 (116)	—	326 (1450)	571 (2540)	—	—
14-24	24	3.5 (89)	60.0 (183)	450 (204)	—	736 (3273)	1104 (4911)	—	—
25-30	24	3.5 (89)	57.0 (174)	430 (195)	—	707 (3145)	1075 (4782)	—	—
31-37	24	3.5 (89)	54.0 (165)	415 (188)	—	678 (3015)	1045 (9648)	—	—
38-45	24	2.87 (73)	51.0 (155)	400 (181)	—	560 (2491)	1016 (4519)	—	—
46-53	24	2.87 (73)	48.0 (146)	385 (175)	—	536 (2384)	904 (4021)	—	—
54-61	24	2.87 (73)	45.0 (137)	370 (168)	—	513 (2281)	880 (2914)	—	—
62-69	24	2.87 (73)	42.0 (128)	350 (159)	—	489 (2175)	856 (3807)	—	—
14-24	32	3.5 (89)	80.0 (244)	613 (278)	—	982 (4368)	1472 (6547)	—	—
25-30	32	3.5 (89)	76.0 (232)	593 (269)	—	943 (4194)	1433 (6374)	—	—
31-37	32	3.5 (89)	72.0 (219)	570 (258)	—	904 (4021)	1394 (6200)	—	—
38-45	32	2.87 (73)	68.0 (207)	553 (251)	—	747 (3323)	1237 (5502)	—	—
46-53	32	2.87 (73)	64.0 (195)	533 (242)	—	715 (3180)	1205 (4360)	—	—
54-61	32	2.87 (73)	60.0 (183)	508 (230)	—	683 (3038)	1173 (5217)	—	—
62-69	32	2.87 (73)	56.0 (171)	488 (221)	—	651 (2896)	1141 (5075)	—	—

*Excluding 18 in (457 mm) lightning rods.

**Based on wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C. Moment force only applicable for top mounting.

Andrew offers a complete line of transmitting antenna systems for Multipoint Distribution Service (MDS) and Instructional Television Fixed Service (ITFS) bands and receiving antenna systems for 2500-2700 MHz. A few representative antennas are presented here. Special radiation patterns are also available.

Input Power rating is 100 watts for 2150 to 2163 MHz and 500 watts for 2500 to 2700 MHz antennas.

Radome. Transmitting antennas are equipped with a full fiberglass radome for environmental protection.

Wind Survival. Antennas will withstand a 112 mph (180 km/h) wind without damage.

Pressurization. Antennas, except for unpressurized types, should be operated under dry air or gas pressure up to 10 lb/in^2 (70 kPa) maximum.

Typical Systems are illustrated on pages 36 and 37.

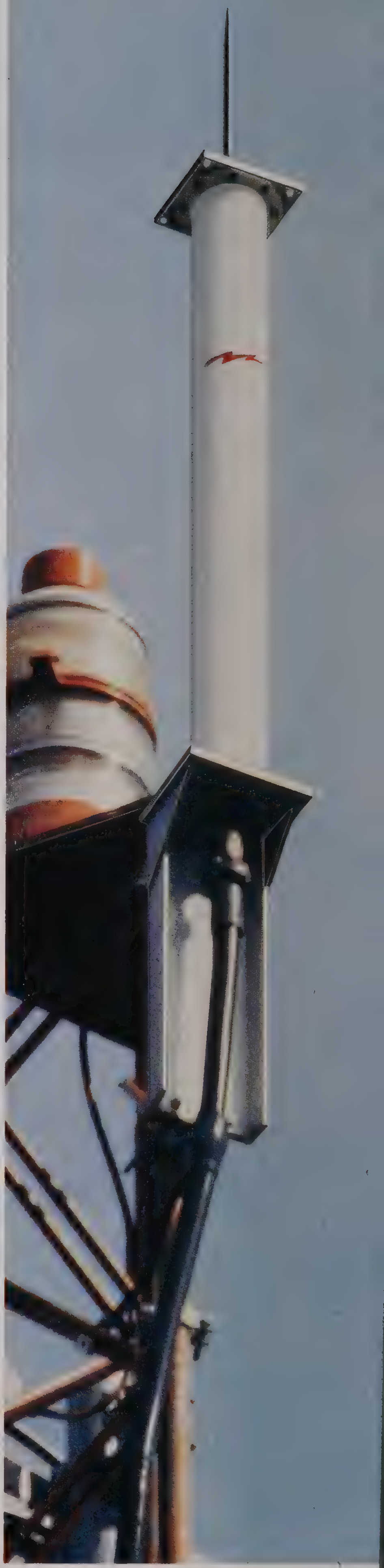
Receiving Antennas for 2500-2700 MHz. The antennas listed are solid parabolic types and do not require pressurization. They are also suitable for low power (10 watt) transmit or transmit/receive applications. Additional antennas are listed on pages 66 and 67.

Power Dividers, listed in the table, allow two antennas to be fed from one transmitter with equal power division. Splitter loss is 3 dB.

Frequency Band, MHz	Input	Dielectric	Type No.
2150-2163	N Jack	Solid	**62795**
2150-2163	7/8" EIA	Air	**64104**
2500-2700	7/8" EIA	Air	**58249**

Additional Information

For radiation patterns and other detailed information, contact your local Andrew Sales Office listed on the inside back cover and request Bulletins 1052G (2150-2163 MHz) and 1056D (2500-2700 MHz).



2150-2163 MHz MDS Antenna Characteristics

Medium Gain Antennas, Unpressurized, Type N Input

Type Number	**62422**	**62423**	**63152**	**63500**
Frequency, MHz	2150-2163	2150-2163	2150-2163	2150-2163
Polarization	Vertical	Vertical	Horizontal	Horizontal
Azimuth Pattern	Omni	Cardioid	Omni	Cardioid
Vertical Beamwidth, degrees	10	10	10	10
Gain, dBi, at 2150 MHz	10	13	10	13
VSWR, maximum	1.25	1.25	1.25	1.25
Length, in (mm)	48 (1220)	49 (1245)	38 (965)	32 (815)
Weight, lb (kg)	8 (3.7)	11 (5.0)	12 (5.5)	18 (8.2)
Windload Shear*, lb (N)	18 (80)	29 (130)	37 (165)	68 (300)
Overturning Moment*, lb-ft (N·m)	42 (55)	—	45 (60)	105 (140)

High Gain Antennas, Pressurized, 7/8" EIA Input

Type Number	**63159**	**63160**	**63502A**	**63503**
Frequency, MHz	2150-2163	2150-2163	2150-2163	2150-2163
Polarization	Vertical	Horizontal	Vertical	Horizontal
Azimuth Pattern	Omni	Omni	Cardioid	Cardioid
Vertical Beamwidth, degrees	5	5	5	5
Gain, dBi, at 2150 MHz	13	13	16	16
VSWR, maximum	1.25	1.25	1.25	1.25
Length**, in (mm)	88 (2235)	88 (2235)	88 (2235)	88 (2235)
Weight, lb (kg)	60 (27.3)	60 (27.3)	60 (27.3)	60 (27.3)
Windload Shear*, lb (N)	190 (845)	190 (845)	190 (845)	190 (845)
Overturning Moment*, lb-ft (N·m)	460 (625)	460 (625)	460 (625)	460 (625)

*Based on RS-222C standard, wind pressure of 50 lb/ft^2 (2.4 kPa) for flat surfaces, and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, with 112 mph (180 km/h) wind.
**Add 18 inches (460 mm) for lightning rod.

2500-2700 MHz ITFS and MMDS Transmitting Antenna Electrical Characteristics

Antenna Type No.	Polarization	Azimuth Pattern Type	Elevation Pattern No.	Beamtilt Degrees	Gain, dBi at 2600 MHz	VSWR Max.**	Input Type
HMD8HO-(*)	Horizontal	Omnidirectional	HMD8EL	0.5	11	1.25	7/8″ EIA, 50 ohm
HMD12HO-(*)	Horizontal	Omnidirectional	HMD12EL	0.5	13	1.25	7/8″ EIA, 50 ohm
HMD16HO-(*)	Horizontal	Omnidirectional	HMD16EL	0.5	14	1.25	7/8″ EIA, 50 ohm
HMD8HC-(*)	Horizontal	Cardioid	HMD8EL	0.5	14	1.25	7/8″ EIA, 50 ohm
HMD12HC-(*)	Horizontal	Cardioid	HMD12EL	0.5	16	1.25	7/8″ EIA, 50 ohm
HMD16HC-(*)	Horizontal	Cardioid	HMD16EL	0.5	17	1.25	7/8″ EIA, 50 ohm
HMD24HC-(*)	Horizontal	Cardioid	HMD24EL	0.5	19	1.25	7/8″ EIA, 50 ohm
HMD32HC-(*)	Horizontal	Cardioid	HMD32EL	0.5	20	1.25	7/8″ EIA, 50 ohm
HMD8VO-(*)	Vertical	Omnidirectional	HMD8EL	0.5	11	1.25	7/8″ EIA, 50 ohm
HMD12VO-(*)	Vertical	Omnidirectional	HMD12EL	0.5	13	1.25	7/8″ EIA, 50 ohm
HMD16VO-(*)	Vertical	Omnidirectional	HMD16EL	0.5	14	1.25	7/8″ EIA, 50 ohm
HMD8VC-(*)	Vertical	Cardioid	HMD8EL	0.5	14	1.25	7/8″ EIA, 50 ohm
HMD12VC-(*)	Vertical	Cardioid	HMD12EL	0.5	16	1.25	7/8″ EIA, 50 ohm
HMD16VC-(*)	Vertical	Cardioid	HMD16EL	0.5	17	1.25	7/8″ EIA, 50 ohm
HMD24VC-(*)	Vertical	Cardioid	HMD24EL	0.5	19	1.25	7/8″ EIA, 50 ohm
HMD32VC-(*)	Vertical	Cardioid	HMD32EL	0.5	20	1.25	7/8″ EIA, 50 ohm

*Insert following ITFS Group Letter or W:
A = 2500 – 2542 MHz   B = 2506 – 2548 MHz   C = 2548 – 2590 MHz   D = 2554 – 2596 MHz   E = 2596 – 2638 MHz   F = 2602 – 2644 MHz   G = 2644 – 2686 MHz   H = 2650 – 2680 MHz   W = Extra cost wide band option 2500 – 2686 MHz

**For "W" suffix (wide band) antenna VSWR is 1.35 max.

2500-2700 MHz ITFS and MMDS Transmitting Antenna Mechanical Characteristics

Antenna Type No.	Top- or Side-Mount	Mounts to Pipe Dia, in (mm)	(H) Height† in (mm)	Radome Dia. in (mm)	Weight lb (kg)	Windload‡ Shear lb (N)	Overturning Moment‡ ft-lb (N·m)
HMD8HO	Top	1 – 3 (25 – 75)	67 (1702)	5 (127)	25 (11.3)	75 (334)	300 (407)
HMD12HO	Top	1 – 3 (25 – 75)	84 (2134)	5 (127)	35 (15.9)	104 (463)	620 (841)
HMD16HO	Top	1 – 3 (25 – 75)	106 (2692)	5 (127)	45 (20.4)	130 (578)	1015 (1376)
HMD8HC	Side	4.5 (115)**	38.5 (978)	8 (203)	40 (18.2)	115 (512)	–
HMD12HC	Side	4.5 (115)**	60.4 (1534)	8 (203)	55 (25.0)	157 (698)	–
HMD16HC	Side	4.5 (115)**	72.5 (1841)	8 (203)	75 (34.0)	181 (805)	–
HMD24HC	Side	4.5 (115)**	107.5 (2730)	8 (203)	79 (35.8)	251 (1116)	–
HMD32HC	Side	4.5 (115)**	144.5 (3670)	8 (203)	140 (64.5)	333 (1481)	–
HMD8VO	Top	1 – 3 (25 – 75)	67 (1702)	5 (127)	17 (7.7)	75 (334)	300 (407)
HMD12VO	Top	1 – 3 (25 – 75)	84 (2134)	5 (127)	30 (13.6)	104 (463)	620 (841)
HMD16VO	Top	1 – 3 (25 – 75)	106 (2692)	5 (127)	45 (20.4)	130 (578)	1015 (1376)
HMD8VC	Side	1 – 3 (25 – 75)*	40 (1016)	5 (127)	40 (18.2)	115 (512)	–
HMD12VC	Side	1 – 3 (25 – 75)*	57 (1448)	5 (127)	55 (25.0)	157 (698)	–
HMD16VC	Side	1 – 3 (25 – 75)*	80 (2032)	5 (127)	75 (34.0)	181 (805)	–
HMD24VC	Side	4.5 (115)**	107.5 (2730)	8 (203)	79 (35.8)	251 (1116)	–
HMD32VC	Side	4.5 (115)**	160 (4064)	8 (203)	140 (64.5)	333 (1481)	–

*162757 4″ IPS Mount Kit available.
†Measured from top antenna plate to bottom of 26 inch (660 mm) mounting bracket. The lightning rod, included with top mount antennas only, is an additional 18 in (457 mm).
‡Based on 112 mph (180 km/h) wind pressure 50 lb/ft^2 (2.4 kPa) for flat and 33 lb/ft^2 (1.6 kPa) for cylindrical surfaces, no ice per RS-222-C.
**163653 Kit available to adapt 4.5 in pipe mount to 1-3 in diameter pipe mount.

2500-2700 MHz ITFS and MMDS Receiving Antennas

Type Number	Aperture ft (m)	Gain, dBi ±0.2 at 2600 MHz	Beamwidth, degrees Vertical	Beamwidth, degrees Horizontal	VSWR Maximum	Order Radome Type	Output Type	Mounts to Pipe Dia., in (mm)
49001A	2 (0.6)	21.7	13.0	13.0	1.3	R2D	N Jack	3/4-3 (19-75)
49002	4 (1.2)	27.9	6.3	6.3	1.3	R4D	N Jack	4.5 (115)
49003	6 (1.8)	31.4	4.2	4.2	1.3	R6D	N Jack	4.5 (115)

Type 3002 SPIRA-CONE™ Roof-Mounted Omnidirectional HF Antenna

HF Systems Capabilities

Andrew provides products, system engineering, management and integration services for a range of strategic and tactical communications and Electronic Support Measures (ESM) applications for HF through microwave frequencies. These advanced technologies provide government and defense users with enhanced capabilities.

The range of products includes:

- GRANGER® tactical and strategic HF communications antennas
- Real-time HF frequency management systems
- Complete communications systems
- HF direction-finding and single-station location systems
- Special terrestrial and satellite monitoring systems
- Jam-resistant communications antenna arrays
- Signal processing systems

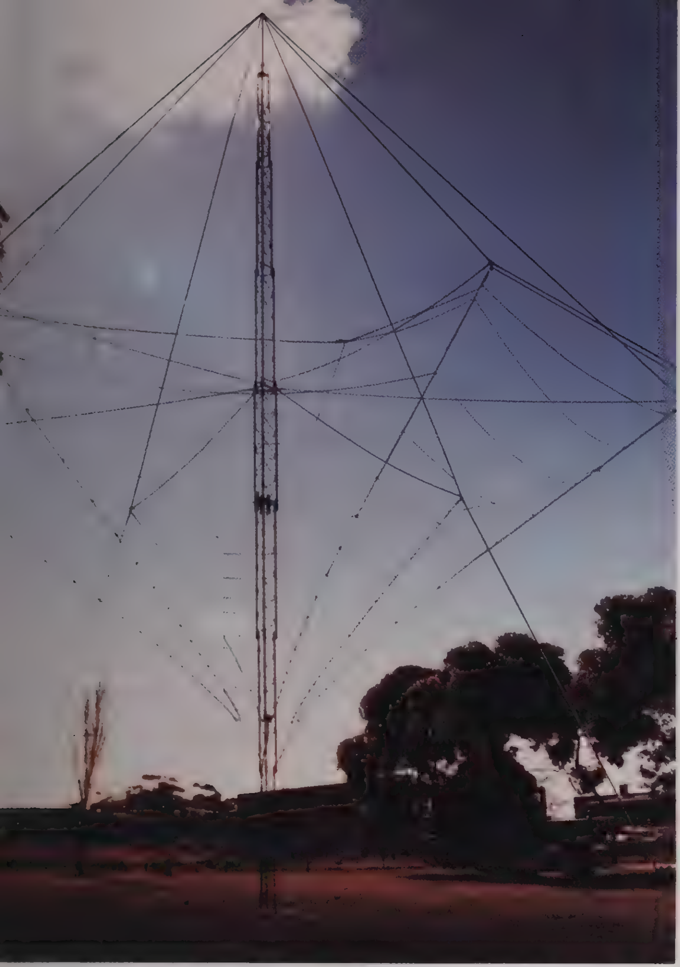
Andrew can draw on its worldwide resources to solve problems in communications and ESM, with an especially strong capability in HF applications for which a range of analytic tools and products has been developed.

®GRANGER is the registered trademark under which HF antennas and related products are sold by Andrew.

GRANGER HF Antennas

Andrew now manufactures the complete range of GRANGER HF antennas. These include fixed, transportable and rotatable log-periodic antennas, conical monopoles, broadband dipoles, baluns, multicouplers and the unique, patented SPIRA-CONE antenna which permits simultaneous radiation in high-and low-angle modes without frequency restriction. GRANGER

Type 2004 Rotatable Roof-Mounted Log-Periodic HF Antenna



Type 3003MT SPIRA-CONE™ Transportable Omnidirectional HF Antenna

Type CQS-100 Channel Quality Sounder

Type 3065 Broadband Dipole HF Antenna

antennas are designed to withstand severe environmental conditions and meet applicable U.S., U.K. and NATO military specifications. Mechanical design is based on EIA Standard RS222C. Structures are typically designed to survive a wind velocity of 120 mph (192 km/h) without ice load and 100 mph (160 km/h) with 0.5 in (12 mm) of radial ice. Antennas with increased ratings are available.

Real-Time HF Frequency Management

Efficient use of the HF spectrum requires quantitative measurement of the transmission characteristics of assigned frequency channels. This becomes particularly important when high-speed data modems are employed. Andrew produces the CQS-100 Channel Quality Sounder to automatically recommend the most suitable channel. The required measurements are performed with very low transmitter power within the assigned bandwidth, eliminating interference to other services.

HF Communications Systems and Services

Andrew provides the following services, system engineering and systems:

- Analysis of user requirements and specifications
- Design, including traffic analyses and use of advanced ionospheric modeling techniques
- System and equipment specifications
- Supply of complete communications systems, including antennas, cabling, transmitters and receivers, modems and terminal equipment
- HF real-time frequency management subsystems
- Site planning, civil works, installation and commissioning

Electronic Support Measures

Andrew offers advanced HF direction-finding and emitter-locating systems (SKYLOC™), capable of providing fully automatic emitter bearing or emitter location for signals propagating in the skywave mode. The systems measure both the azimuth and elevation angles of received signals and can determine the emitter location from a single receiving site, or a group of stations can be operated as a triangulation network.

SKYLOC systems bring together a number of technological improvements in angle-of-arrival processing and in the effective use of both real-time and predicted ionospheric information to achieve an accuracy in emitter-position determination not previously achieved.

Advanced signal processing techniques are available to support automatic signal recognition, acquisition, classification and tracking. These are produced to meet specific user requirements.

Anti-Jam Receiving Systems

Using newly developed adaptive algorithms, Andrew is developing the electronic components and software to offer increased resistance to noise, interference and jamming for communications systems operating at frequency ranges from HF through microwave. These solutions have a rapid, stable adaptation and can use existing antenna arrays and ancillary equipment in many situations. The techniques are applicable to both conventional and frequency-hopping modulation formats.

Antenna Selection Chart

The HF antenna selection chart suggests the applicable range of each model assuming 1-hop F_2 layer propagation at the optimum traffic frequency (OTF).

Other modes such as "E Layer" or "Multi-hop" can alter or extend the predicted performance.

Refer to the individual antenna descriptions in the catalog and request technical bulletins for further applications information and full specifications. A plasticized transmission diagram with patterns of popular antennas is available for initial circuit planning. Request Bulletin 1401.

Polarization

H	Horizontal	▢	Ground Wave Only
V	Vertical	■	With Elevated Apex
E	Elliptical	▨	Height Dependent

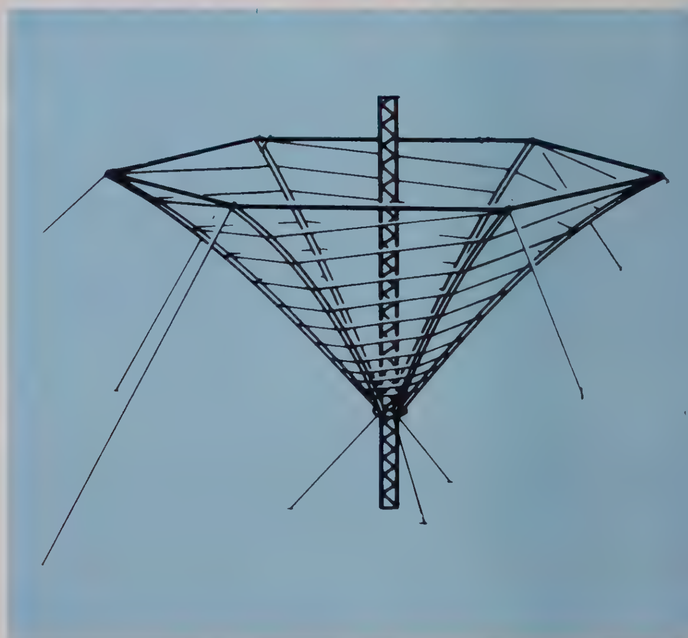
Antenna Type	Pol	Short 0-500 km	Medium 500-2000 km	Long 2000 and Greater	See Pages
Omnidirectional					
3001 high-angle mode	H/E				146-149
3001 low-angle mode	H/E				146-149
3002/3003 high-angle mode	H/E				146-149
3002/3003 low-angle mode	H/E				146-149
2001	E				150
1794	V				152, 153
2753	V				154, 155
Dipoles-Broadband					
3065	H				156, 157
1765	H				158, 159
Log Periodic					
747FCD	H				160, 161
2701	H				162
2702	H				162
1703	V				163
2726	V				163
Rotatable Log Periodic					
2731	H				164, 165
2004	H				166, 167

3000 Series SPIRA-CONE™ Broadband Multi-Mode Antennas

General Description

Many operational applications require medium- to long-range omnidirectional antennas; for example, shore-to-ship and ground-to-air services. The patented* SPIRA-CONE uses a four-arm conical logarithmic spiral with interleaved wire elements.

The 3000 Series Antennas employ horizontal-elliptical polarization, with its well-known advantage of minimizing fades. The antennas are log-periodic, spiral arrays, supported on a single, central, guyed tower for simplicity of installation. The apex of the hexagonal cone points toward the ground, and its height above the ground determines the take-off angle of the main (lowest) lobe. Depending on the feed option selected, up to three transmitters can radiate through the antenna simultaneously without any frequency restriction or tuning networks.



Features

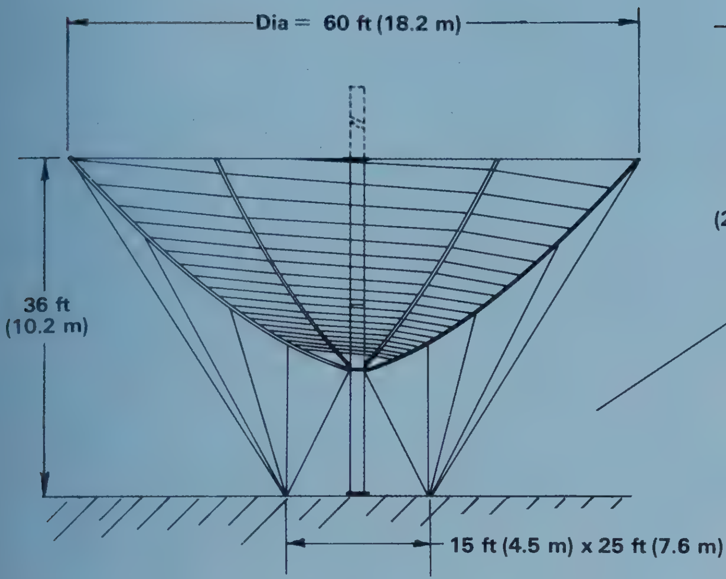
Choice of Operating Modes. Two families of elevation patterns (mode 1 and mode 2) can be generated by selective excitation of the four arms:

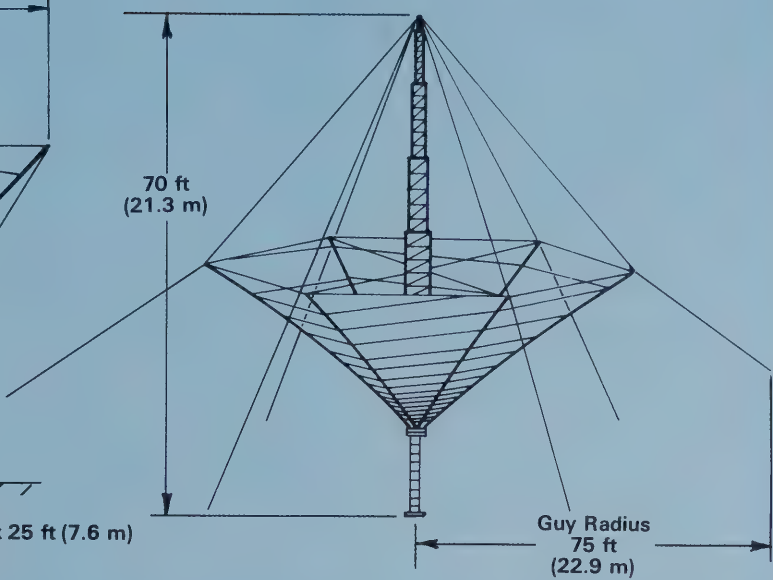
Mode 1 beam maximum is off-axis of tower (low-angle mode) with overhead null.

Mode 2 beam maximum is on-axis of tower (high-angle mode) with overhead maximum.

Single Mode Operation (SM). The SPIRA-CONE will be permanently connected in either of the required modes at installation.

*United States Patent 4,498,084.
United Kingdom Application 8,333,407.





Characteristics, Series 3001 – Full Sized

Type	HF log periodic, spiral, omnidirectional
Frequency Range, MHz	3 models 2/3.6-30 MHz 3/5.2-30 MHz 4/7.2-30 MHz
Power Rating, kW	Up to 25 average, 50 peak
Polarization	Horizontal-elliptical; can be installed for right or left rotation, as required
Input Impedance, ohms	50, coaxial input option
VSWR	2.0:1 maximum
Directive Gain, dBi	7
Azimuth Plane Radiation Pattern	Omnidirectional within ±1 dB nominal
Elevation Plane Radiation Pattern	Variable with frequency and mode selection
Efficiency	Greater than 95%
Wind Survival Rating, mph (km/h)	
Without Ice	140 (225)
With 0.5 in (12 mm) Radial Ice	60 (100)

Characteristics, Series 3002, 3003 & 3004 – Compact

Type	HF log periodic, spiral, omnidirectional
Frequency Range, MHz	2.0-30 MHz (high-angle mode) 4.0-30 MHz (low-angle mode)
Power Rating, kW	Up to 5 average and peak
Polarization	Horizontal-elliptical; can be installed for right or left rotation, as required
Input Impedance, ohms	50, coaxial
VSWR	2.0:1 maximum
Directive Gain, dBi	7 nominal
Azimuth Plane Radiation Pattern	Omnidirectional within ±1.5 dB
Elevation Plane Radiation Pattern	Variable with frequency and mode selection
Wind Survival Rating, mph (km/h)	
Without Ice	100 (160)

Note: Higher environmental capacity by special order.

Switched Mode Operation (SW). Single input switched mode is available. Switching is carried out at the balanced inputs of the SPIRA-CONE™ by means of relay contacts controlled by cable from a unit located at the control center. Full remote control systems are available.

Dual-Mode Operation (DM). Each of the two separate modes of the SPIRA-CONE is activated separately and independently through a patented multi-mode coupler* permitting simultaneous operation by two transmitters, limited only by the low-frequency specification of each mode.

Triple-Mode Operation (TM). It is possible to feed two separate high-angle modes of operation in addition to the low-angle mode resulting in the ability to transmit simultaneously up to three independent signals. The result is a saving in land area for the DM and TM SPIRA-CONE antennas with respect to conventional antennas.

Outstanding performance is achieved when the antenna is used as a receiving antenna. The anti-fading benefits of elliptical polarization are immediately evident by the reduction in signal fading, which is equivalent to space or polarization diversity.

*United States Patent Application 563,288.
United Kingdom Patent 8,431,845.

Sizes Available

Full Sized. Designed for main communication centers, the 3001 Series Antennas offer the highest efficiency and power gain required for worldwide omnidirectional use such as shore-to-ship services. Since the 3001 Series Antennas require no ground screen, their performance exceeds that of vertically-polarized monopoles which suffer significant ground losses. Typically, over poor soil, a gain advantage of 6-7 dBi can be expected. Elliptical polarization can further add to system performance.

Compact. Compact models offer similar performance advantages in truncated array designs which are terminated to extend low frequency beyond the natural unloaded frequency. Input power is limited by radiator size, insulators and terminations. This model will accept up to 5 kW total average power. The antennas differ in mounting arrangements and application. All are available with mode option kits.

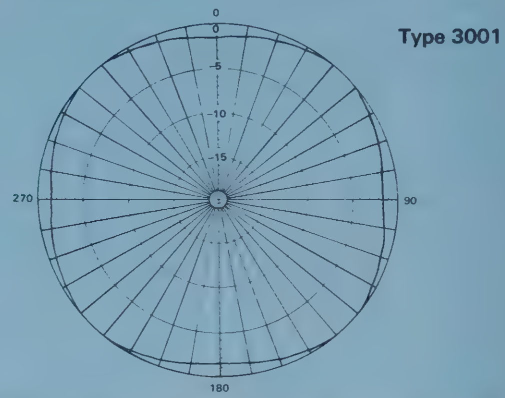
Roof Mounted (Series 3002). The 3002 Series Antennas were designed for applications in which only roof-top space is available, such as diplomatic services, security services and operational headquarters. Elevation patterns are influenced by array height above the effective ground. The array is supported by six tubular fiberglass compression booms. It can also be ground mounted where space is at a premium.

Transportable (Type 3003MT). The Type 3003MT is particularly suited to applications such as emergency or transportable communications centers, in which its omnidirectional high- and medium-low-angle elevation patterns provide communication on short to medium paths by skywave reflection. The elliptical polarization is especially effective when the distant terminal is mobile. Supported by a 70 ft (21 m) lightweight, nested aluminum mast, the antenna can be deployed by a team in under two hours. An installation site of 75 ft (23 m) radius is required.

Fixed (Types 3004-70 & 3004-90). Electrically similar to the 3003 transportable, this fixed-station model offers two array heights, supported by galvanized steel lattice masts of 70 or 90 ft (21 or 27 m). This model provides a choice of elevation angles

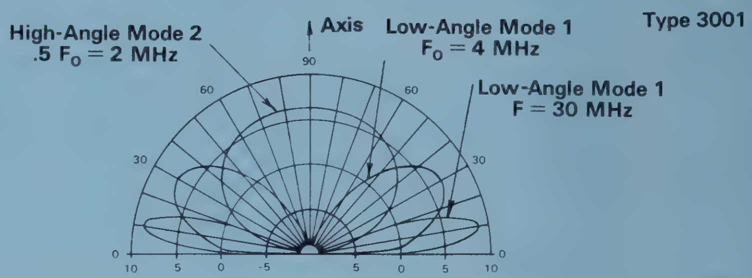
Typical Azimuth Radiation Pattern

Full-Sized Series
(Directive gain in dB below beam peak)



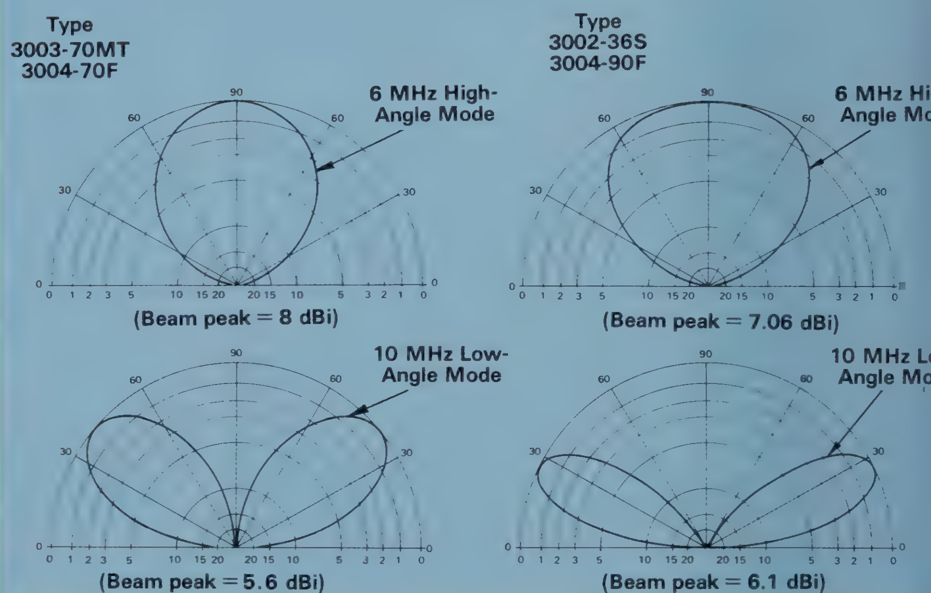
Typical Elevation Plane Radiation Pattern

Full-Sized Series



Elevation Plane Radiation Patterns

Compact Series
(Directive gain in dB below beam peak)



to match communication requirements; the 90 ft (27 m) version offers lower angles necessary for longer distances.

Erection accessory kits are available.

For further details on Type 3000 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1405A.

Ordering Information, Series 3001

Type Number / Mode	3001-2VL-(*) Very Low Angle	3001-2L-(*) Low Angle	3001-2ML-(*) Medium Low Angle	3001-3L-(*) Low Angle	3001-3ML-(*) Medium Low Angle	3001-4L-(*) Low Angle
Tower Height, ft (m)	240 (73.2)	220 (67.1)	190 (57.9)	150 (45.7)	130 (39.6)	120 (36.6)
Guy Radius, ft (m)	267 (81.4)	265 (80.8)	208 (63.4)	166 (50.6)	157 (47.9)	135 (41.2)
Freq. Range High-Angle Mode, MHz	2-30	2-30	2-30	3-30	3-30	4-30
Freq. Range Low-Angle Mode, MHz	3.6-30	3.6-30	3.6-30	5.4-30	5.4-30	7.2-30
4 MHz Upper 1/2 Power Angle, deg	57	66	70			
4 MHz Beam Peak Angle, deg	33	38	42			
4 MHz Lower 1/2 Power Angle, deg	16	17	19			
6 MHz Upper 1/2 Power Angle, deg				57	68	
6 MHz Beam Peak Angle, deg				33	40	
6 MHz Lower 1/2 Power Angle, deg				16	18	
8 MHz Upper 1/2 Power Angle, deg						52
8 MHz Beam Peak Angle, deg						30
8 MHz Lower 1/2 Power Angle, deg						14
30 MHz Upper 1/2 Power Angle, deg	15	15	31	15	31	15
30 MHz Beam Peak Angle, deg	10	10	20	10	20	10
30 MHz Lower 1/2 Power Angle, deg	5	5	9	5	9	5

(*) Append with Power Level Function Number from Series 3001 Option Table below.

Series 3001 Option Number Table – Power Level Functions

Power Rating, kW Average	Peak	Single Mode (SM)	Switched Mode (SW) Single	Dual	Dual Mode (DM)	Triple Mode (TM)	Input Connector
Receive Only		–1	–21	—	–30	—	Type N Jack
1	2	–1	–21	—	–31	–41	Type N Jack
5	10	–2	–22	—	–32	—	7/8″ EIA
10	20	–3	–23	–53	–33	—	1-5/8″ EIA
25	50	–4	–24	—	—	—	3-1/8″ EIA

Ordering Information, Series 3002 Compact Series – Tubular Boom Types

Type No.	Support Type	Mounting	Low Freq, MHz High Angle	Low Angle	Power Rating kW Average/Peak	Height ft (m)
3002-36S-(*)	Standard 100 mph, no ice	Roof or Ground	2.0	4.0	5/5	36 (11)
3002-36M-(*)	High Environment	Ground	2.0	4.0	5/5	36 (11)

(*)Append Power Level Function Number from Table 3002, 3003 and 3004 below.

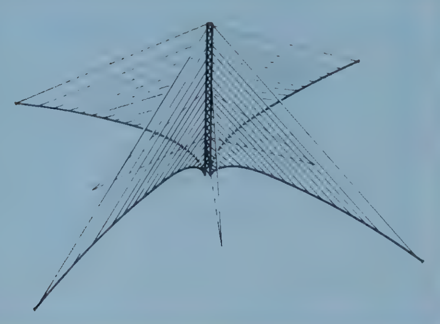
Ordering Information, Series 3003 & 3004 Compact Series – Catenary Supported Types

Type No.	Support Type	Mounting	Low Freq, MHz High Angle	Low Angle	Power Rating kW Average/Peak	Height ft (m)
3003-70MT-(*)	Transportable†	—	2.0	4.0	5/5	70 (21)
3004-70F-(*)	Fixed	Ground	2.0	4.0	5/5	70 (21)
3004-90F-(*)	Fixed	Ground	2.0	4.0	5/5	90 (27)

(*)Append Power Level Function Number from Table 3002, 3003 and 3004 below. †Erection Kit included; other option accessories available.

Series 3002, 3003 & 3004 Option Number Table – Power Level Functions

Power Rating, kW Average	Peak	Single Mode (SM)	Switched Mode (SW)	Dual Mode (DM)	Triple Mode (TM)	Input Connector
Receive Only		–1	–21	–30	—	Type N Jack
1	2	–1	–21	–31	–41	Type N Jack
5	5	–2	–22	–32	—	7/8″ EIA



2001 Series Elliptically Polarized Broadband Antennas

General Description

The 2001 Series Antennas were developed to fill the need for a more efficient broadband antenna, capable of providing radiation characteristics essential for reliable short- to medium-range communications. Communication performance beyond that achieved with either vertically- or horizontally-polarized antennas is possible.

Features

Improved Reliability. The use of elliptical polarization has proven to be effective in avoiding deep fading. Short-range circuits are particularly subject to this kind of fading, which reduces circuit reliability. The 2001 Series Antennas have both very effective elliptical polarization and, in addition, are highly efficient (no lossy termination) at all frequencies in the 2-30 MHz range.

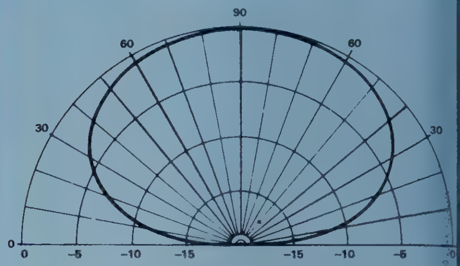
The 2001 Series Antennas maintain a continuity of elevation plane pattern at all frequencies and give reliable continuous coverage over variable circuit distances.

Applications

Omnidirectional. The omnidirectional azimuth plane pattern provides optimum coverage for communications centers, airports and ground-air and shore stations for shore-ship communications.

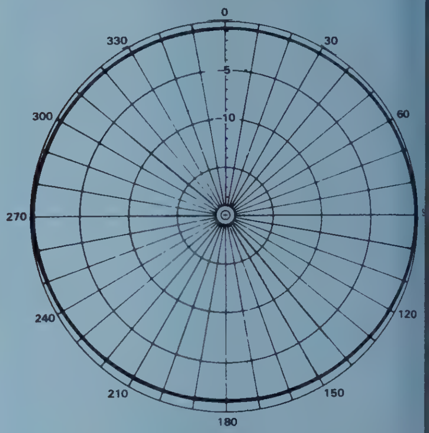
For further details on Type 2001 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1422.

Typical Elevation Plane Pattern



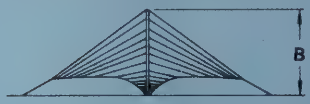
2.0 MHz, Maximum Gain = 5.90 dBi

Typical Azimuth Plane Pattern
(60° Elevation Angle)

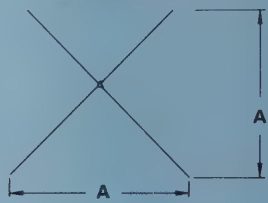


2.0 MHz, Maximum Gain = 5.90 dBi

Antenna Dimensions



Elevation View



Plan View

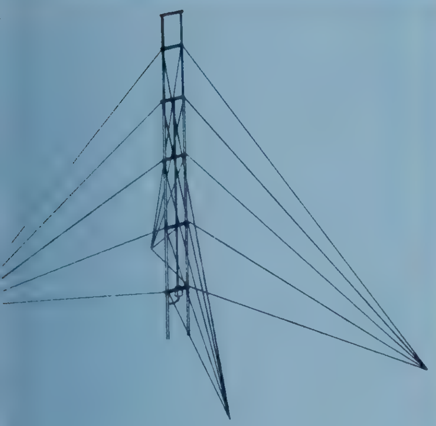
Characteristics

Type	Omnidirectional broadband
Frequency Range, MHz	2.0, 2.85 or 4-30 MHz
Power Rating, kW	Up to 25 average, 50 peak
Polarization	Elliptical – either sense depending upon connection of radiators to feedline at time of installation
Input Impedance, ohms	50, coaxial
VSWR	2.0:1 maximum
Gain, dBi	5 minimum; 7 maximum
Azimuth Plane Radiation Pattern	Omnidirectional
Efficiency	Greater than 95%
Wind Survival Rating, mph (km/h)	
Without Ice	140 (225)
With 0.5 in (12mm) Radial Ice	90 (145)

Ordering Information

Type Number*	Frequency Range MHz	Power Rating kW Average	Power Rating kW Peak	Input Connector Female	Dimensions A Length & Width ft (m)	Dimensions B Height ft (m)
2001-1-1K	2-30	10	20	1-5/8" EIA	300 (91.5)	132 (40.2)
2001-1-2K	2-30	1.5	3	7/8" EIA	300 (91.5)	132 (40.2)
2001-1-3K	2-30	Receive Only		Type N Jack	300 (91.5)	132 (40.2)
2001-1-4K	2-30	25	50	3-1/8" EIA	300 (91.5)	132 (40.2)
2001-2-1K	2.85-30	10	20	1-5/8" EIA	210 (64.0)	92 (28.0)
2001-2-2K	2.85-30	1.5	3	7/8" EIA	210 (64.0)	92 (28.0)
2001-2-3K	2.85-30	Receive Only		Type N Jack	210 (64.0)	92 (28.0)
2001-2-4K	2.85-30	25	50	3-1/8" EIA	210 (64.0)	92 (28.0)
2001-3-1K	4-30	10	20	1-5/8" EIA	164 (50.0)	72 (21.9)
2001-3-2K	4-30	1.5	3	7/8" EIA	164 (50.0)	72 (21.9)
2001-3-3K	4-30	Receive Only		Type N Jack	164 (50.0)	72 (21.9)
2001-3-4K	4-30	25	50	3-1/8" EIA	164 (50.0)	72 (21.9)

*The letter suffix "K" denotes that the antenna is supplied with "knock-down" (unassembled) towers.



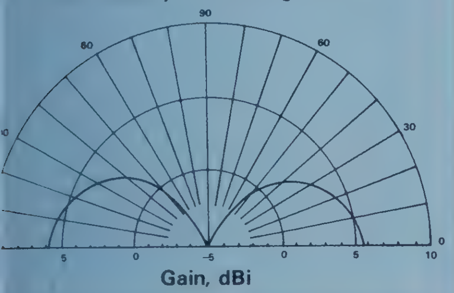
4094 Series Omnidirectional Transportable Antenna

General Description

The Type 4094 is a vertically polarized omnidirectional HF broadband antenna. This is the ideal antenna for locations where ground area is limited and rapid deployment is important.

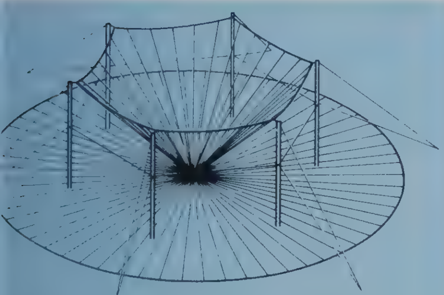
For further details on Type 4094 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1431.

Typical Low Frequency Elevation Plane Radiation Pattern
Over Perfectly Conducting Ground



Characteristics

Type	Omnidirectional vertical dipole (terminated)
Frequency Range, MHz	2-30
Power Rating, kW	1 average, 2 peak or receive only
Polarization	Vertical
VSWR (50 ohms)	2.5:1 nominal, 3.0:1 maximum
Efficiency	10% minimum to 60% across bandwidth
Ground Screen Elements Required	None
Guying Radius, ft (m)	30 (9.1)
Tower Height, ft (m)	60 (18.3)
Ground Area Required, ft^2 (m^2)	820 (76) nominal
Wind Survival Rating, mph (km/h)	
Without Ice	95 (150)
With 0.26 in (6.5 mm) Radial Ice	65 (100)



Type 794 Series MONOCONE™ HF Antenna

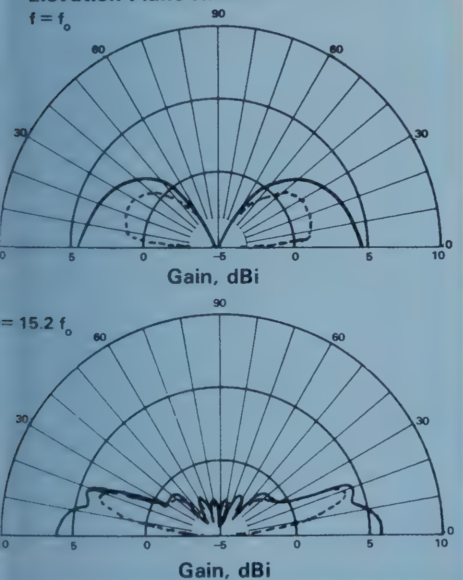
General Description

The 794 Series MONOCONE Antennas have been designed for high-power area coverage transmission and are particularly suited to shore/ship, ground/air and HF broadcast applications. The broad frequency range permits use of the optimum frequency for any distance, while the radiation patterns are suitable for skywave propagation at medium and long ranges, supplemented by groundwave propagation at short ranges. The antennas perform efficiently at all frequencies within the specified ranges.

Strength and Durability. All exposed materials are highly corrosion resistant; aluminum, copper, epoxy-bonded fiberglass and stainless steel fittings.

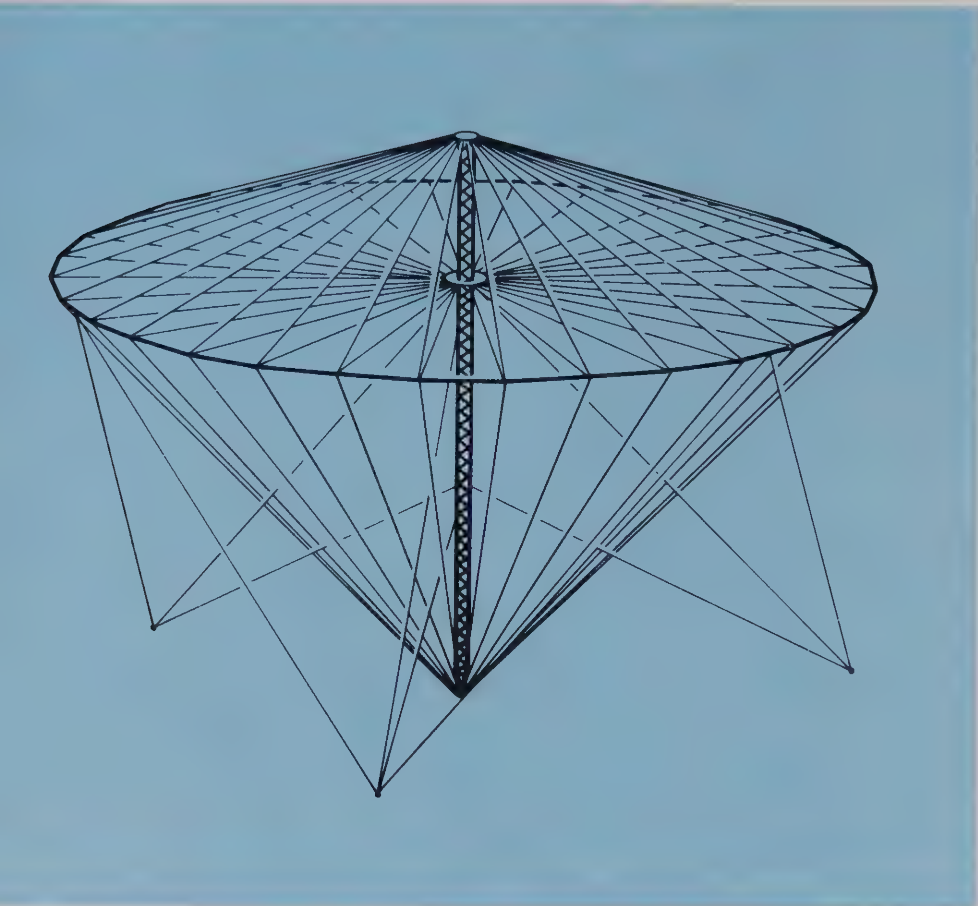
For further details on Type 794 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1416.

Elevation Plane Radiation Patterns



Characteristics

Type	HF MONOCONE
Frequency Range, MHz	2-30, 2.5-32 or 3-32
Power Rating, kW	Up to 40 average, 160 peak
Polarization	Vertical
VSWR (50 ohms)	2.0:1 maximum
Azimuth Plane Radiation Pattern	Circular within ±0.75 dB
Wind Survival Rating, mph (km/h)	
Without Ice	120 (190)
With 1/2 in (12 mm) Radial Ice	100 (160)



1794 Series MONOCONE™ Antenna

General Description

MONOCONE antennas are designed for very long-range, high-power applications such as air-to-ground, shore-to-ship and HF broadcast. Advanced design provides superior electrical performance with a single central support tower.

MONOCONE antennas are the first vertical omnidirectional antennas to radiate all HF frequencies effectively. The broad frequency range permits use of the optimum frequency for any distance. The radiation patterns are suitable for skywave propagation at medium and long ranges, and groundwave propagation at short distances.

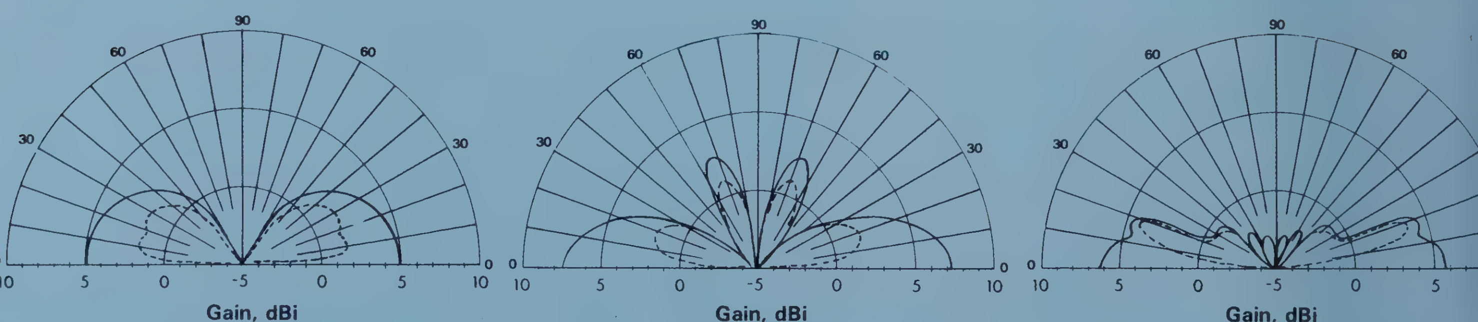
Radiation Patterns

Elevation plane radiation patterns are illustrated below. Frequency is stated in terms of the lower frequency limit (f_0), which is 1.6, 2.0, 2.4, 2.8, 4.0 or 5.6 depending upon type. At the higher frequencies, which are generally useful for long range skywave transmission, radiation is concentrated at the lower elevation angles. At the lower frequencies, which are useful for shorter ranges, the radiation patterns show greater gain at the higher angles required for skywave transmission, while preserving sufficient gain at the low angles to facilitate ground wave propagation.

Characteristics

Type	Omnidirectional Conical Monopole
Frequency Range, MHz	1.6, 2.0, 2.4, 2.8, 4.0 or 5.6-32
Power Rating, kW	Up to 40 average, 160 peak
Polarization	Vertical
VSWR (50 ohms)	2.0:1 maximum
Azimuth Plane Radiation Patterns	Circular within ± 0.75 dB
Wind Survival Rating, mph (km/h)	
Without Ice	120 (190)
With 0.5 in (12 mm) Radial Ice	90 (140)

Elevation Plane Radiation Patterns



——— Patterns over perfectly conducting ground.

- - - - - - Patterns over average soil with a ground screen provided. Average soil is defined as having a conductance of 0.012 mhos/metre and a relative dielectric constant of 15.

The radiation patterns shown are representative of the entire frequency range. There are no frequencies within the specified ranges at which the pattern deteriorates significantly from those shown.

A curtain erection kit which contains cables and miscellaneous hardware for raising the curtain and ring is included with the antenna.

Accessories – Optional:

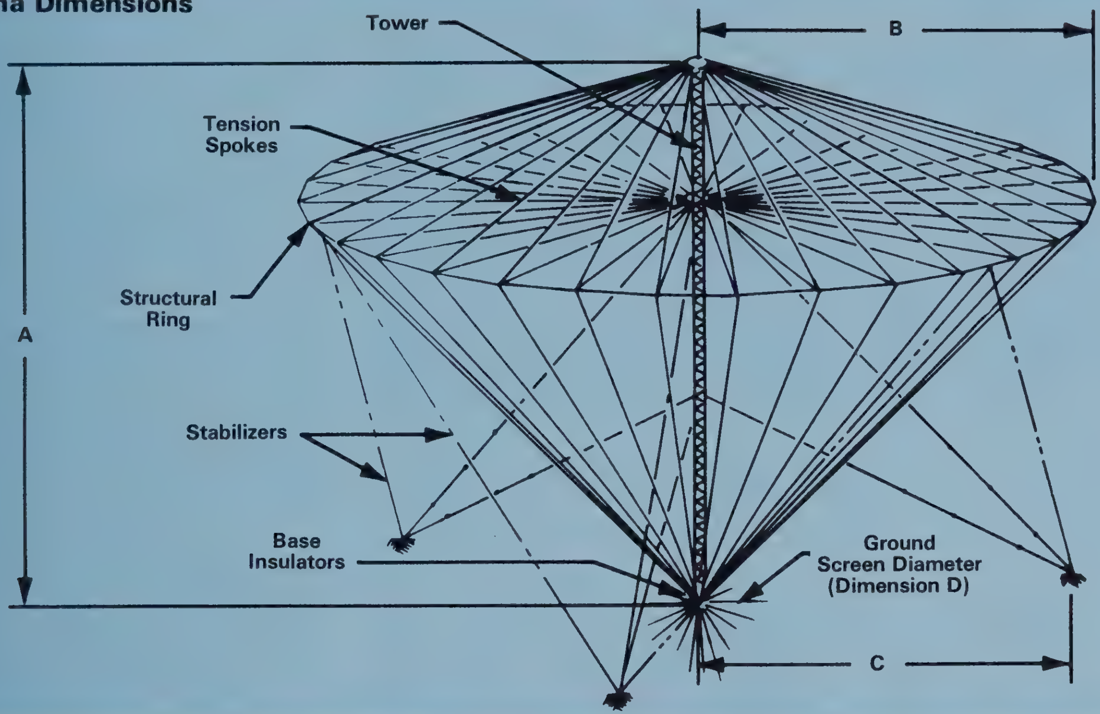
Tower Erection Fixture for erection of tower by sections.

Hand Winch Kit

Tower Lighting Kit with isolating transformer.

For further details on Type 1794 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1421.

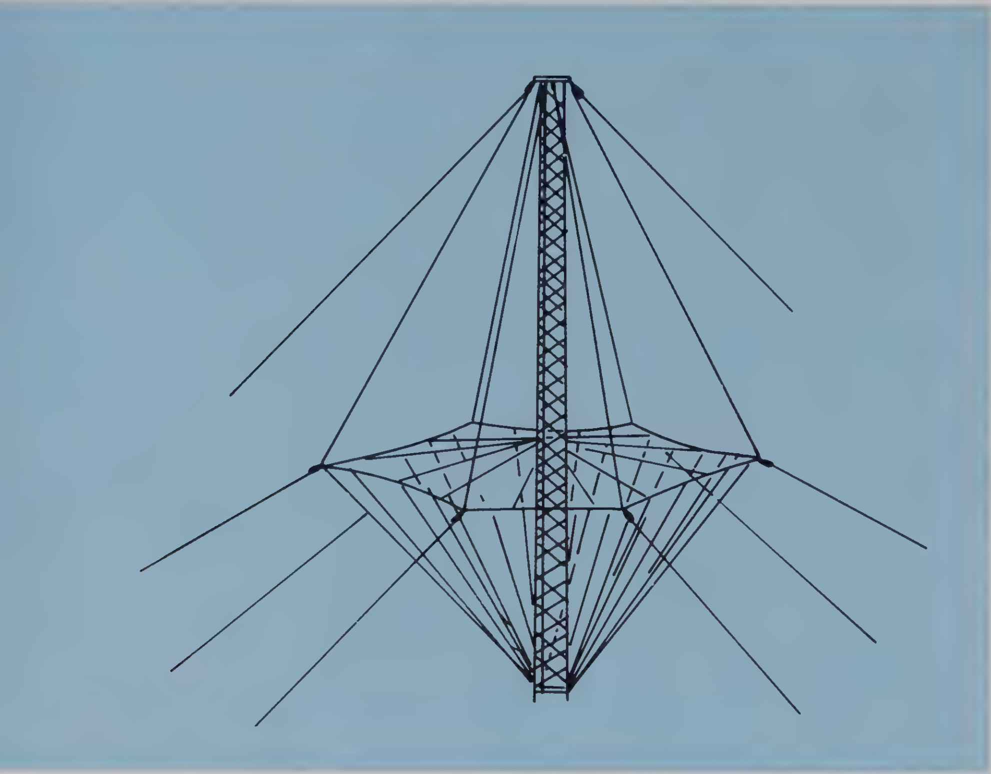
Antenna Dimensions



Ordering Information

Type Number*	Frequency Range MHz	Power Rating kW Average	Power Rating kW Peak	Input Connector Female	Dimensions A ft (m)	Dimensions B ft (m)	Dimensions C ft (m)	Dimensions D ft (m)
1794-101LF	1.6 – 32	10	40	1-5/8″ EIA	86 (26)	63 (19)	60 (18)	246 (75)
1794-102LF	1.6 – 32	Receive Only		Type N Jack	86 (26)	63 (19)	60 (18)	246 (75)
1794-1K	2.0 – 32	40	160	3-1/8″ EIA	86 (26)	63 (19)	60 (18)	246 (75)
1794-101K	2.0 – 32	10	40	1-5/8″ EIA	86 (26)	63 (19)	60 (18)	246 (75)
1794-102K	2.0 – 32	Receive only		Type N Jack	86 (26)	63 (19)	60 (18)	246 (75)
1794-3K	2.4 – 32	40	160	3-1/8″ EIA	71 (22)	52 (16)	49 (15)	205 (63)
1794-103K	2.4 – 32	10	40	1-5/8″ EIA	71 (22)	52 (16)	49 (15)	205 (63)
1794-104K	2.4 – 32	Receive only		Type N Jack	71 (22)	52 (16)	49 (15)	205 (63)
1794-5K	2.8 – 32	40	160	3-1/8″ EIA	61 (19)	45 (14)	42 (13)	176 (54)
1794-105K	2.8 – 32	10	40	1-5/8″ EIA	61 (19)	45 (14)	42 (13)	176 (54)
1794-106K	2.8 – 32	Receive only		Type N Jack	61 (19)	45 (14)	42 (13)	176 (54)
1794-7K	4.0 – 32	40	160	3-1/8″ EIA	43 (13)	32 (10)	29 (9)	123 (38)
1794-107K	4.0 – 32	10	40	1-5/8″ EIA	43 (13)	32 (10)	29 (9)	123 (38)
1794-108K	4.0 – 32	Receive only		Type N Jack	43 (13)	32 (10)	29 (9)	123 (38)
1794-9K	5.6 – 32	40	160	3-1/8″ EIA	31 (10)	23 (7)	19 (6)	88 (27)
1794-109K	5.6 – 32	10	40	1-5/8″ EIA	31 (10)	23 (7)	19 (6)	88 (27)
1794-110K	5.6 – 32	Receive only		Type N Jack	31 (10)	23 (7)	19 (6)	88 (27)

*The letter suffix "K" denotes that the antenna is supplied with "knockdown" (unassembled) tower.



2753 Series Conical Monopole Antennas

General Description

The 2753 Conical Monopole Antenna Series replaces the 753C Conical Monopole Antenna Series, providing a number of improvements in specification.

All versions are of the same configuration, differing only in size. The radiating structure is in the form of a cage supported by a central tower. The lower part of the antenna forms a compensating inductive stub in shunt with the feed terminals. This arrangement keeps the structure at dc ground potential, thereby eliminating the need for a base supporting insulator or for isolation of any required lighting circuit. The antenna is supplemented by a radial ground screen composed of soft-drawn copper wire.

Application

The 2753 Conical Monopole Antenna Series provides a cost-effective solution for the vertical omnnidirectional antenna if the full bandwidth of the Monocone Type 1794 is not required.

Many applications are satisfied by the six to one frequency bandwidth of the monopole and its elevation plane characteristics. Such services include:

Ground Wave

- Shore-to-ship 1.6-3.8 MHz
- Base station-to-mobile, short range

Skywave

- Medium- to long-range ground-to-air
- Base station-to-outstations requiring medium to low angle
- Shore-to-ship HF service
- Omni HF Broadcast including meteorological service

Transportable

The 2753T-6, transportable version, follows the same electrical design as the fixed versions. Erected dimensions are similar. Materials are selected for their rugged nature and reuse in the field.

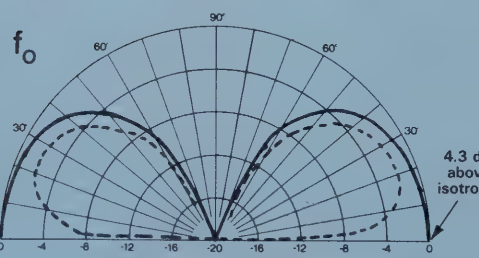
The radiating curtain and ground screen are of stainless steel flexible wire; the mast is aluminum lattice of 17 inch face width; guy members are Terylene® or Parafil®; anchors are stake or duckbilled type.

VSWR measured in the field is typically within 2.0:1 (2.5:1 max.).

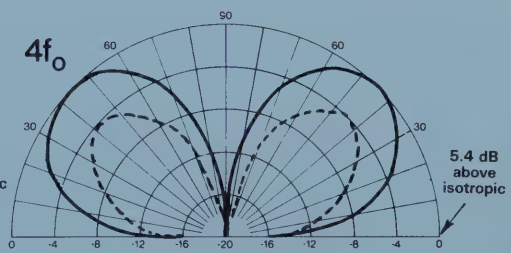
The antenna is complete with reusable packaging and erection tools.

For further details on Type 2753 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1427.

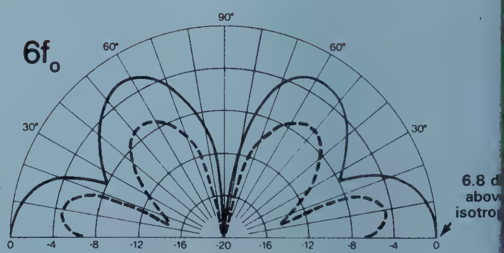
Elevation Plane Radiation Patterns



Directivity, dB Relative to Beam Maximum



Directivity, dB Relative to Beam Maximum



Directivity, dB Relative to Beam Maximum

——— Patterns over perfectly conducting ground at scaled operating frequencies.

f_0 is lowest operating frequency.

– – – – Calculated patterns over average soil 6.0 to 24 MHz antenna without influence of ground screen. Addition of ground screen may be expected to increase gain about 1 dB at elevation angles in the region of 5° to 10°.

Characteristics – 2753, Fixed Version

Peak Power Rating, kW	Up to 50		
Polarization	Vertical		
VSWR	2.0 nominal, 2.3 max.		
Input Impedance, ohms	50, coaxial		
Input Connector (end seals available)	Type N Jack (female) (-1K) 7/8" EIA flange (-2K) 1-5/8" EIA flange (-3K) 3-1/8" EIA flange (-4K)	Receive or	1 kW avg., 2 kW PEP 5 kW avg., 10 kW PEP 10 kW avg., 20 kW PEP 25 kW avg., 50 kW PEP
Directive Gain dBi	5.0 (over perfect ground)		
Azimuth Plane Radiation Pattern	Omnidirectional ±0.75 dB		
Wind Survival Rating, mph (km/h)			
Without ice	120 (190)		
With 0.5 in (13 mm) radial ice	100 (160)		
Tower Erection Kit	A kit of simple erection tools is available for erection of the antennas without the use of a crane.		

Characteristics – 2753T, Transportable Version (same as Fixed Version except as follows)

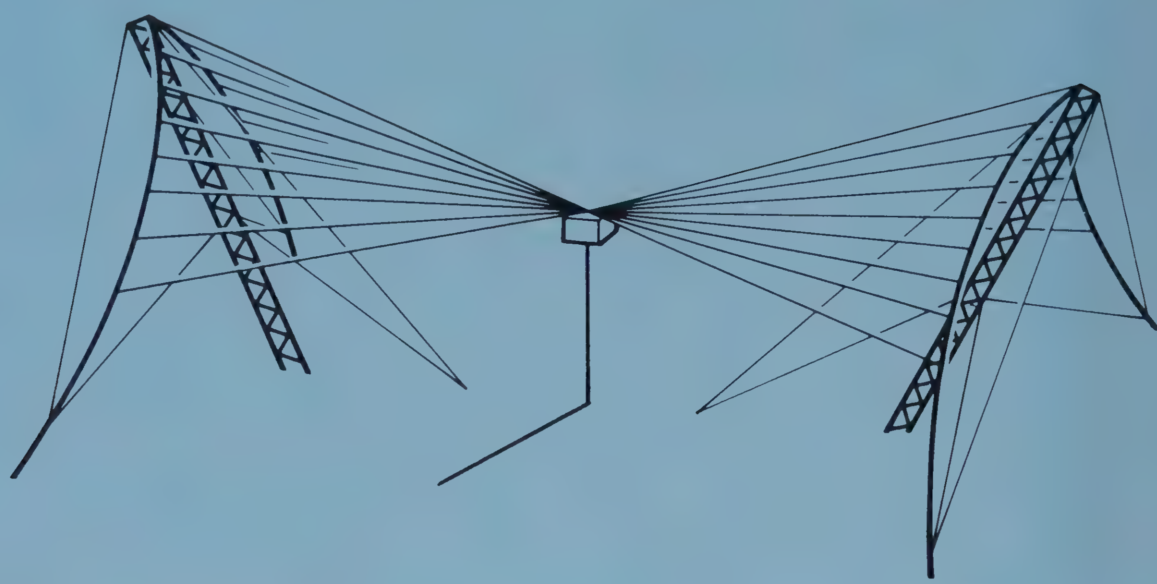
Frequency Range, MHz	4.0 to 24.0		
Input Connector	Type N Jack (female) (-1K) 7/8" EIA flange (-2K) 1-5/8" EIA flange (-3K)	Receive or	1 kW avg., 2 kW PEP 5 kW avg., 10 kW PEP 10 kW avg., 20 kW PEP
Wind Survival Rating, mph (km/h)			
Without ice	100 (160)		
With 0.5 in (13 mm) radial ice	50 (80)		

Ordering Information

Type Number	Frequency Range MHz	Height ft (m)	Ground Screen Diameter ft (m)	Outer Guy Radius ft (m)
2753-1-(*)	1.6 – 9.6	100 (30.5)	300 (91)	105 (32)
2753-2-(*)	2.0 – 12.0	80 (24.4)	240 (73)	85 (26)
2753-4-(*)	2.8 – 16.8	60 (18.3)	170 (52)	65 (20)
2753-6-(*)	4.0 – 24.0	40 (12.2)	120 (36)	45 (14)
2753T-6-(**)	4.0 – 24.0	40 (12.2)	120 (36)	45 (14)
2753-8-(*)	6.0 – 28.0	27.5 (8.4)	80 (24)	30 (9)

*Complete part number requires addition of input connector suffix; - 1K, -2K, -3K or -4K (see characteristics table).

**Complete part number requires addition of input connector suffix; -1K, -2K, or -3K (see characteristics table).



3065 Series Broadband Dipole Antennas

General Description

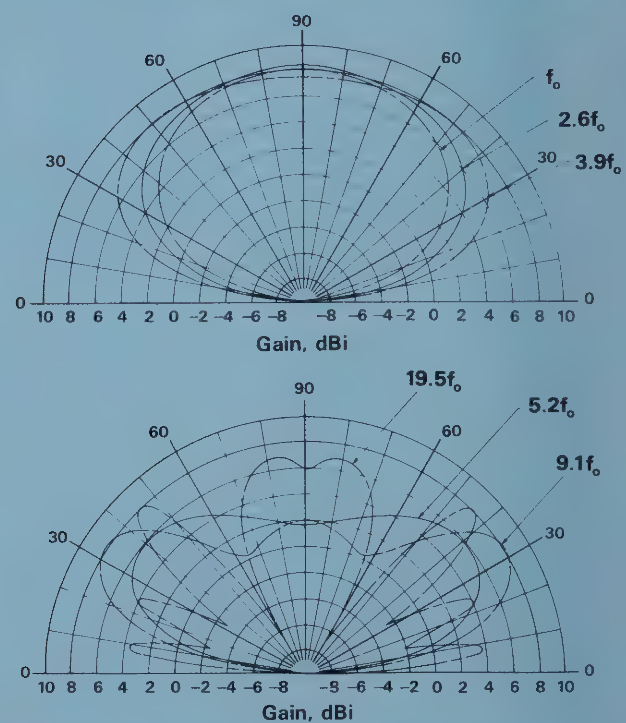
The 3065 Series Antennas are based on the original full-size broadband HF 1765 Antenna Series. The 3065 Antenna Series is more compact than the 1765 Antenna Series for a given low frequency cut-off. This is achieved by frequency extension techniques which maintain high electrical efficiency.

Features

An omnidirectional radiation pattern at the lower frequencies results in improved coverage to and from base stations over short to medium ranges.

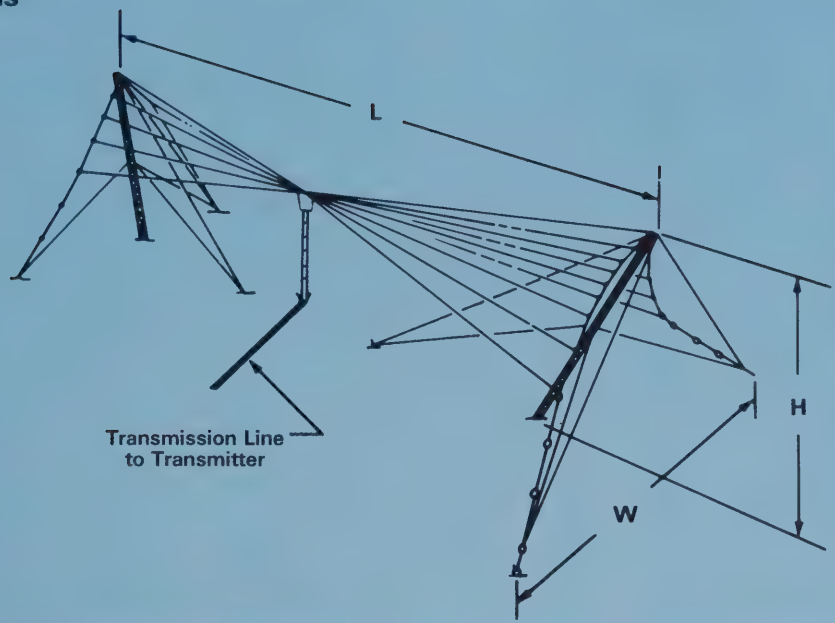
The design of the radiating system has increased the bandwidth over which the azimuth plane pattern is omnidirectional up to six times the lower frequency limit and further reduces the ground area required for installation by 25%.

Elevation Plane Radiation Patterns
(Orthogonal to dipole length)



f_o is lowest operating frequency

Antenna Dimensions



The resultant broadband antenna configuration permits complete compatibility with channelized as well as frequency-agile, synthesized HF radio systems. The antenna is also offered in a transportable tactical version (3065MT), which can be installed by a crew of four in one hour.

Low VSWR maximizes the power available at the antenna, from solid state power amplifiers, resulting in an overall improvement in communications reliability.

For further details on Type 3065 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1430.

Characteristics

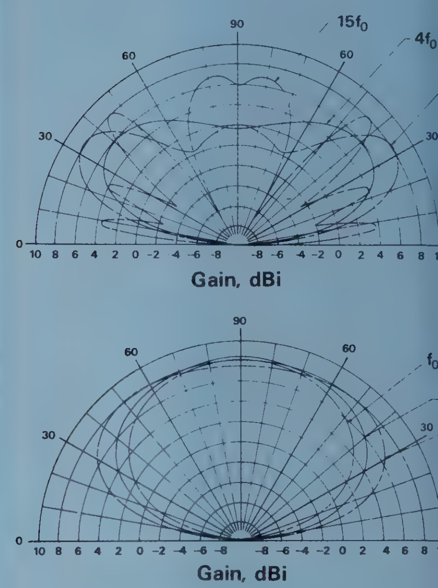
Type	HF broadband dipole
Frequency Range, MHz	1.6 to 3.3 lower limit, 30 maximum
Power Rating, kW	Up to 2.5 average, 5 peak
Polarization	Horizontal
VSWR (50 ohms)	2.0:1 nominal, 2.3:1 maximum
Gain, dBi	8 nominal
Wind Survival Rating, mph (km/h)	
Without Ice	140 (224)
With 0.5 in (12 mm) Radial Ice	50 (80.5)

Ordering Information

Type Number*	Frequency Range MHz	Power Rating kW Average	Power Rating kW Peak	Input Connector Female	Dimensions Length ft (m)	Dimensions Height ft (m)	Dimensions Width ft (m)
3065-101-1K	1.6 – 30	Receive only		Type N Jack	185 (56)	70 (21)	134 (41)
3065-101-2K	1.6 – 30	1	2	Type N Jack	185 (56)	70 (21)	134 (41)
3065-101-3K	1.6 – 30	2.5	5	7/8″ EIA	185 (56)	70 (21)	134 (41)
3065-102-1K	1.9 – 30	Receive only		Type N Jack	160 (49)	60 (18)	115 (35)
3065-102-2K	1.9 – 30	1	2	Type N Jack	160 (49)	60 (18)	115 (35)
3065-102-3K	1.9 – 30	2.5	5	7/8″ EIA	160 (49)	60 (18)	115 (35)
3065-103-1K	2.6 – 30	Receive only		Type N Jack	115 (35)	40 (12)	81 (25)
3065-103-2K	2.6 – 30	1	2	Type N Jack	115 (35)	40 (12)	81 (25)
3065-103-3K	2.6 – 30	2.5	5	7/8″ EIA	115 (35)	40 (12)	81 (25)
3065-104-1K	3.3 – 30	Receive only		Type N Jack	90 (27)	30 (10)	62 (19)
3065-104-2K	3.3 – 30	1	2	Type N Jack	90 (27)	30 (10)	62 (19)
3065-104-3K	3.3 – 30	2.5	5	7/8″ EIA	90 (27)	.30 (10)	62 (19)
3065MT-113L-2T	2.0 – 30	1	2	Type N Jack	115 (35)	40 (12)	62 (19)

*The letter suffix "K" denotes that the antenna is supplied with "knock-down" (unassembled) towers.

Elevation Plane Radiation Patterns
(Orthogonal to dipole length)



1765 Series Broadband Dipole Antennas

General Description

As the first truly broadband dipole HF antenna, the Type 1765 Series Antennas are designed to directly replace existing families of narrowband dipole antennas.

The design of the radiating elements has increased the bandwidth over which the azimuth plane pattern is omnidirectional up to four times the lower frequency limit. The support masts are installed approximately 19° off vertical permitting the outboard guy anchors to be in the same plane as the top of the mast. This reduces the ground area required for any given size of radiating curtain by approximately 30 percent.

The 1765 Series Antennas require no tuning or resistive loading circuitry. This permits complete compatibility with channelized as well as frequency-agile, synthesized HF radio equipment.

Features

The omnidirectional radiation pattern at the lower frequencies provides improved coverage to and from base stations over short to medium ranges.

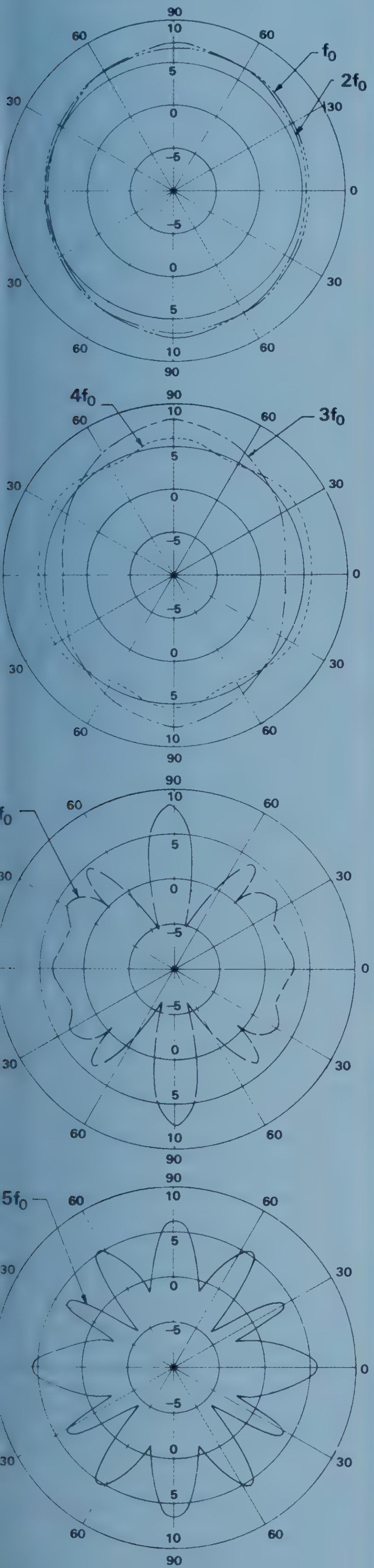
For further details on Type 1765 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1420.

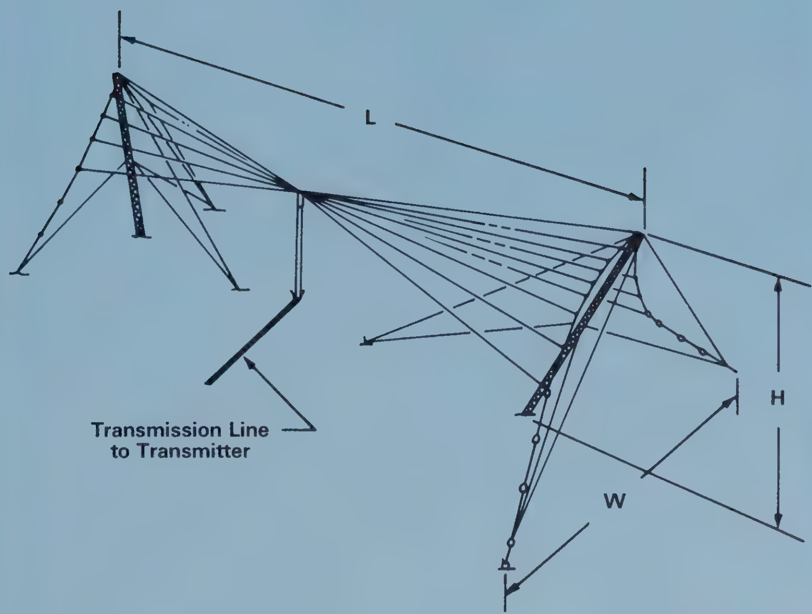
Characteristics

Type	HF broadband dipole
Frequency Range, MHz	1.6 to 4.3 lower limit, 30 maximum
Power Rating, kW	Up to 10 average, 20 peak
Polarization	Horizontal
VSWR	2.0:1 nominal, 2.5:1 maximum
Gain, dBi	8 nominal
Wind Survival Rating, mph (km/h)	
Without Ice	140 (224)
With 0.5 in (12 mm) Radial Ice	50 (80.5)

Azimuth Plane Radiation Patterns at Beam Maximum

(Directive Gain in dBi)





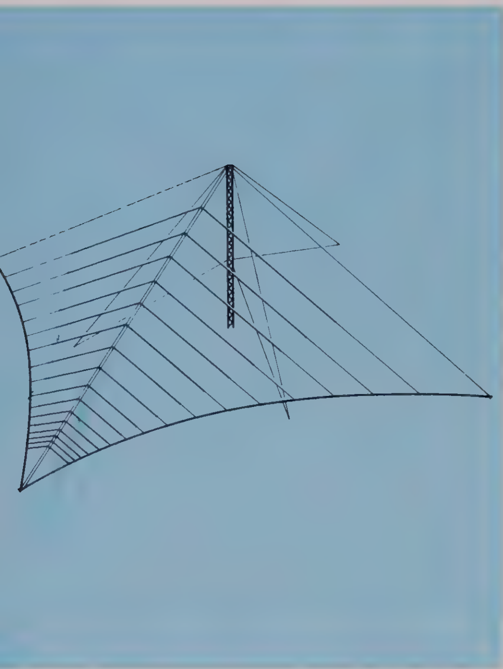
Ordering Information

Type Number	Frequency Range MHz	Dimensions Length ft (m)	Height ft (m)	Width ft (m)
1765-101-(*)	1.6 – 30	230 (70)	85 (26)	167 (51)
1765-120-(*)	2.0 – 30	184 (56)	69 (21)	135 (41)
1765-121-(*)	2.4 – 30	160 (49)	59 (18)	115 (35)
1765-122-(*)	3.4 – 30	115 (35)	40 (12)	81 (25)
1765-123-(*)	4.3 – 30	90 (27)	30 (10)	62 (19)

*See following table for appropriate suffix to Type Number.

Type Number Suffix†	Power Rating kW Average	Peak	Input Impedance ohms	Input Connector
1K	10	20	300 Balanced	Open Line
2K	1	2	50	Type N Jack (female)
3K	2.5	5	50	7/8″ EIA
4K	10	20	50	1-5/8″ EIA
5K	Receive Only		75	Type N Jack (female)
6K	Receive Only		50	Type N Jack (female)

†The letter suffix "K" denotes that the antenna is supplied with "knock-down" (unassembled) towers.



747 Series Horizontally Polarized Fixed and Transportable Antennas

Transportable

General Description. The 747CD Series High-Performance, Log-Periodic Antenna is lightweight, transportable, easy to erect and provides high gain and directivity. It is designed for short-, medium- and long-range communications with a frequency range of 2 to 30 MHz or 4 to 30 MHz. A set of tools and winches and a special erection fixture are provided with the system.

The variable take-off angle array configuration results in a high-performance antenna, well suited to applications where communication over varying distances is required. Elevation angles are appropriate to the frequencies commonly used for short, medium and long distances.

Features. For HF communications stations situated in hurricane and typhoon zones, the 747CD Series Antennas offer quick restoration of operational antenna circuits which are damaged by storms. When such damage occurs, the antenna can be erected and, with some advance preparation, made operational in less than two hours. The advance work includes selecting a tower site, burying the guy and catenary anchors in position and permanently installing the transmission line from the transmitter. The antennas are easy to erect. The 75 ft (22.9 m) tower which supports the antenna is supplied in nested sections with a special erection fixture that simplifies installation. Only two sets of guys are required. There are no locking latches, sliding sections or elaborate cable and pulley arrangements to malfunction; the design simplicity increases ease of assembly and reliability.

Transportability. All versions of the 747CD Series Antenna are sufficiently lightweight to be air transportable. They can also be moved from one location to another by truck or other ground vehicle.

Strength and Durability. The 747CD Series Antennas are built to withstand harsh environments and repeated setup and take-down in the field. The single central tower, which supports each antenna, is fabricated of 6061-T6 aluminum alloy, a material extremely resistant to corrosion. The feedline and radiator assembly, prefabricated in a single unit, is of high-strength Calsun-bronze wire. Spacers are of high-purity alumina ceramic.

Fixed

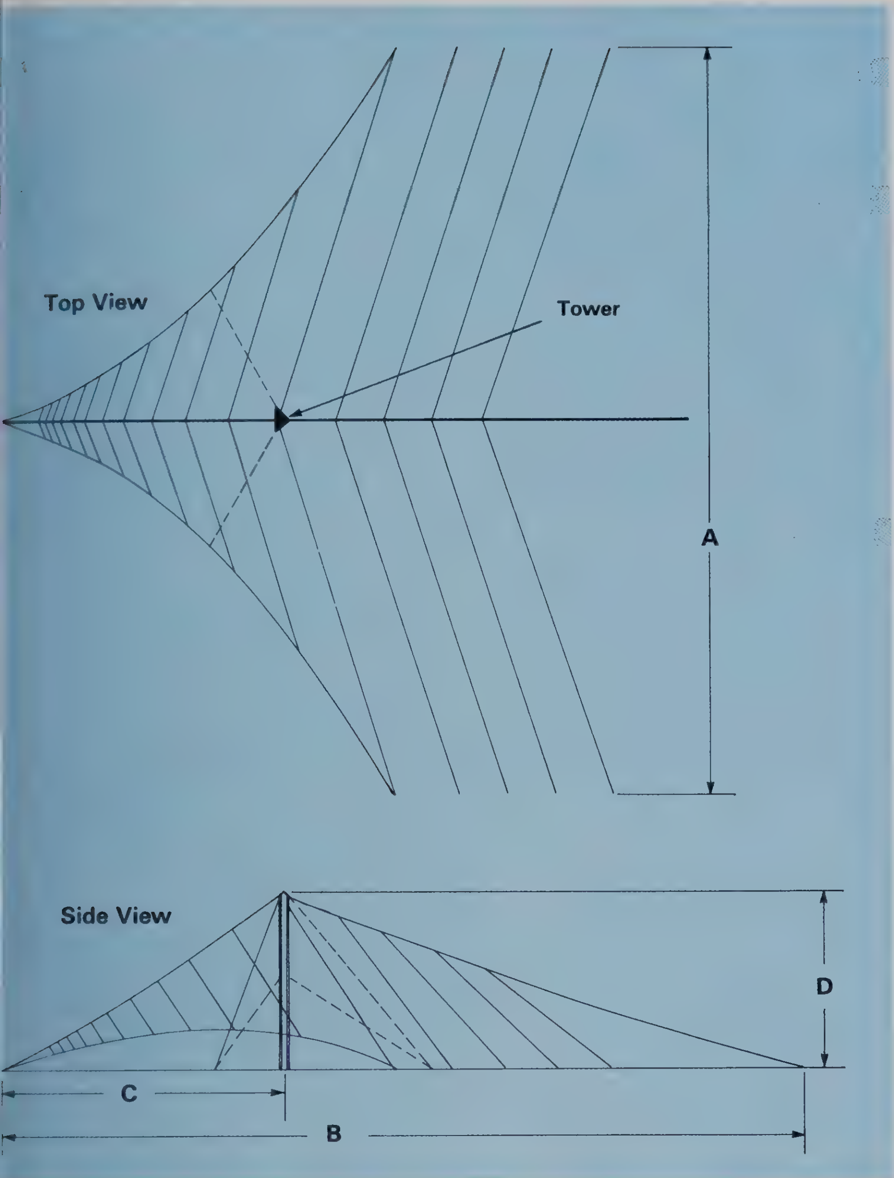
General Description. The 747FCD Series Antennas intended for fixed station applications are based on the single mast, transportable 747CD Log-Periodic Series Antenna. Materials and construction techniques appropriate to a permanent installation are adopted. The result is an economical antenna permitting simple assembly and erection procedures with a single 75 ft (22.9 m) mast, saving on foundation work.

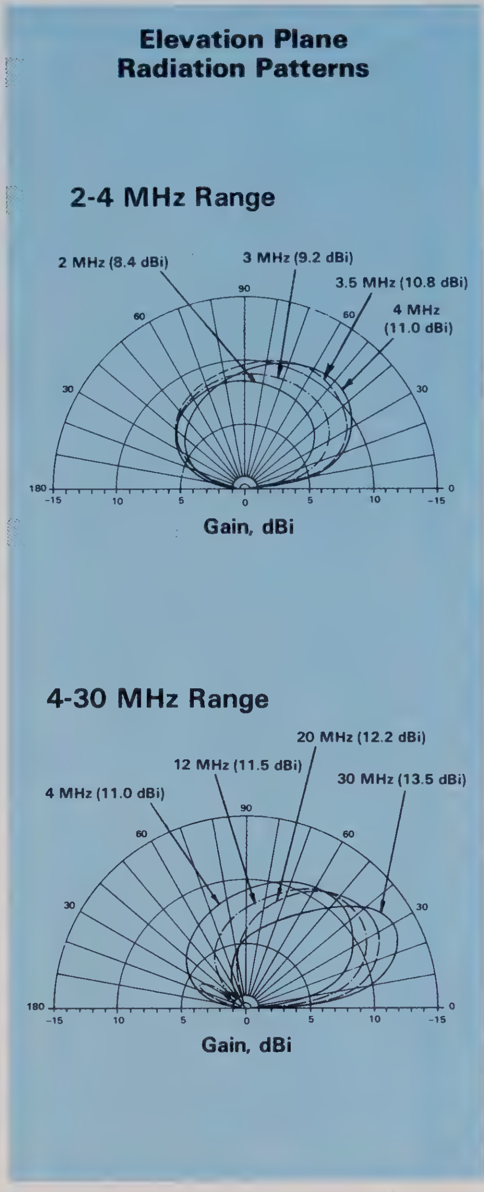
Features. The 747FCD Series Antennas utilize triangular, 17 in (430 mm) face width, guyed tower of lattice steel construction with tubular cross members. All parts are hot-dip galvanized for corrosion resistance. The feedline and radiating curtain are accurately prefabricated from Alumoweld wire. High purity Alumina Ceramic feedline spacers and insulators are used. Array support catenaries are fabricated from Parafil.

For further details, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1411 for Type 747FCD, and Bulletin 1410 for Type 747CD antennas.

Characteristics

	2-30 MHz Series		4-30 MHz Series	
	Transportable	Fixed	Transportable	Fixed
Frequency Range, MHz	2-30	2-30	4-30	4-30
Polarization	Horizontal	Horizontal	Horizontal	Horizontal
VSWR, max.	2.0:1	2.0:1	2.0:1	2.0:1
	(2.5:1 below 4.2 MHz)			
Input Impedance, ohms	50	50	50	50
Gain	See page 161		See page 161	
Azimuth Plane Half-Power Beamwidth, degrees				
2-4 MHz	essentially omnidirectional		—	—
4-30 MHz	—	60	—	60
Max. Length of Any Part When Packed, ft (m)	10 (3.0)	20 (6.0)	10 (3.0)	20 (6.0)
Wind Survival Rating, mph (km/h)				
Without Ice	100 (160)	140 (230)	—	140 (230)
With 0.5 in (12 mm) Radial Ice	50 (80.5)	80 (125)	—	80 (125)
Erection Time (Average Ground)	2 hrs.	—	2 hrs.	—



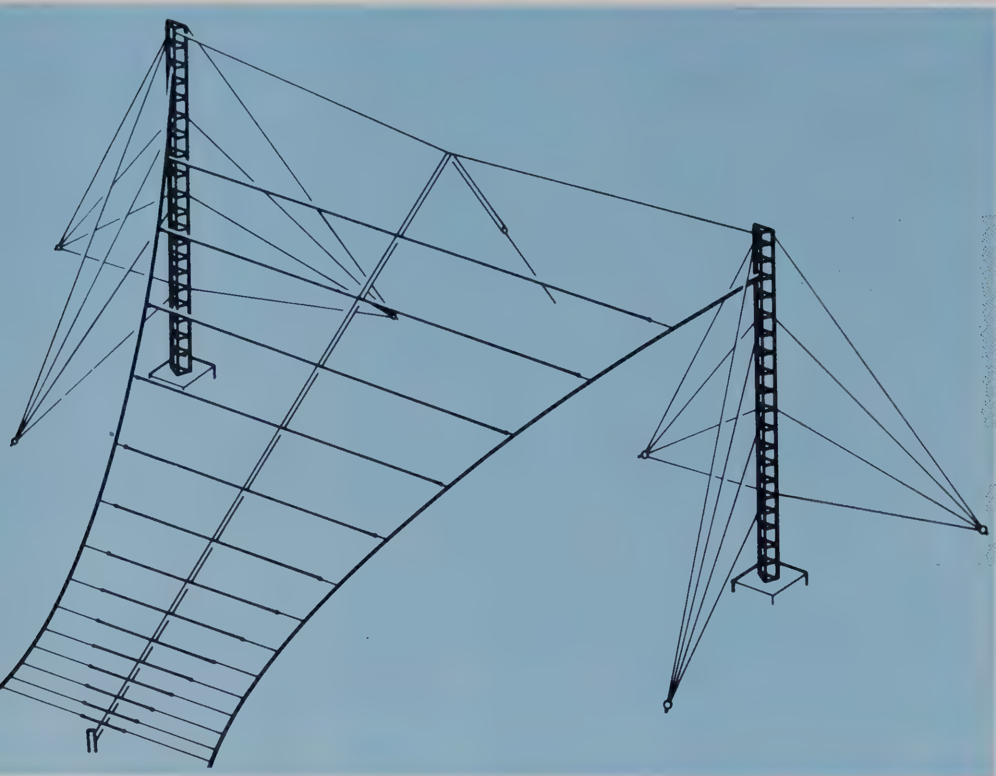


Antenna Dimensions

	A ft (m)	B ft (m)	C ft (m)	D ft (m)
2-30 MHz Series	317.5 (96.8)	328.3 (100.1)	120 (36.6)	75 (22.9)
4-30 MHz Series	303 (92.4)	186 (56.7)	120 (36.6)	75 (22.9)

Ordering Information

Transportable Type Number	Fixed Type Number	Frequency Range, MHz	Power Rating kW Average	Peak	Input Connector Female
747CD-2	747FCD-2	2 – 30	Receive only		Type N Jack
747CD-3	747FCD-3	2 – 30	1	2	Type N Jack
747CD-7	747FCD-7	2 – 30	10	30	1-5/8″ EIA
747CD-9	747FCD-9	2 – 30	2.5	30	7/8″ EIA
747CD-11	747FCD-11	2 – 30	20	40	1-5/8″ EIA
747CD-42	747FCD-42	4 – 30	Receive only		Type N Jack
747CD-43	747FCD-43	4 – 30	1	2	Type N Jack
747CD-47	747FCD-47	4 – 30	10	30	1-5/8″ EIA
747CD-49	747FCD-49	4 – 30	2.5	30	7/8″ EIA
747CD-44	747FCD-44	4 – 30	20	40	1-5/8″ EIA



2701 and 2702 Series Horizontally Polarized Log-Periodic Antennas

General Description

The 2701 and 2702 Series Antennas are horizontally polarized, log-periodic antennas, capable of radiating optimum communications frequencies at the proper elevation angle. Frequency ranges spanning the entire HF spectrum permit transmission of the optimum frequency at all times. The elevation angle of radiation to suit the particular circuit will determine the choice of Type 2701 or 2702, since the radiation pattern is virtually independent of frequency and local ground characteristics.

Features

Economy. The 2701 and 2702 Series Antennas are designed to supply superior performance at minimum cost. Eight graduated frequency ranges are available.

All structural assemblies will withstand highly corrosive environmental agents, such as salt spray. Towers are made of galvanized steel. Catenary support systems are made of Parafil®, which is a highly reliable insulating material.

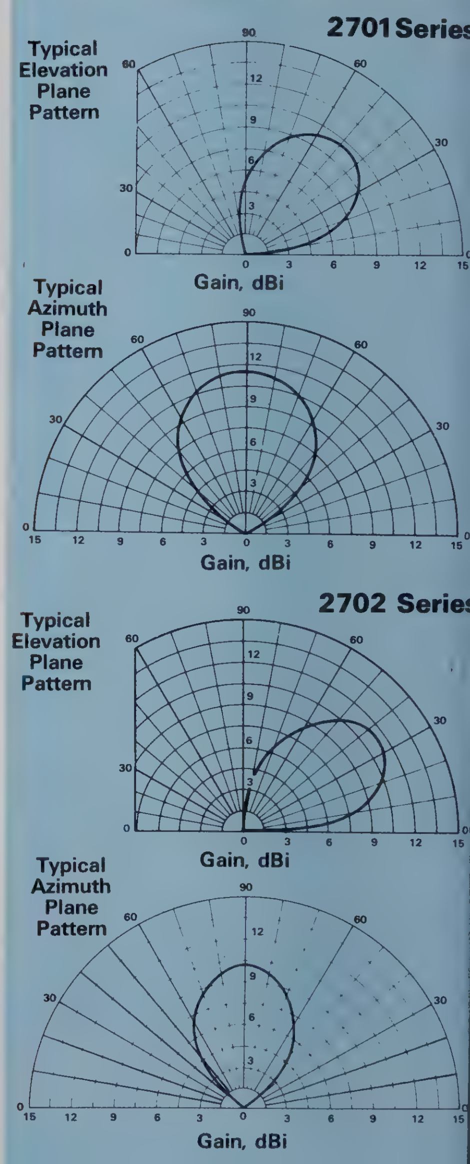
Ease of Installation. Installation of the antennas is simple and rapid. All parts of the log-periodic array and its suspension system are fabricated to exact length, so that no calculation, cutting or adjustment is required for erection on level land.

2701 Series, Short to Medium Range. 2701 Series Antennas develop a broad lobe, directed at high elevation angles in order to reach short distances.

2702 Series, Medium to Long Range. In comparison with the 2701 Series, those in the 2702 Series develop a somewhat narrower lobe, directed at lower elevation angles in order to reach greater distances.

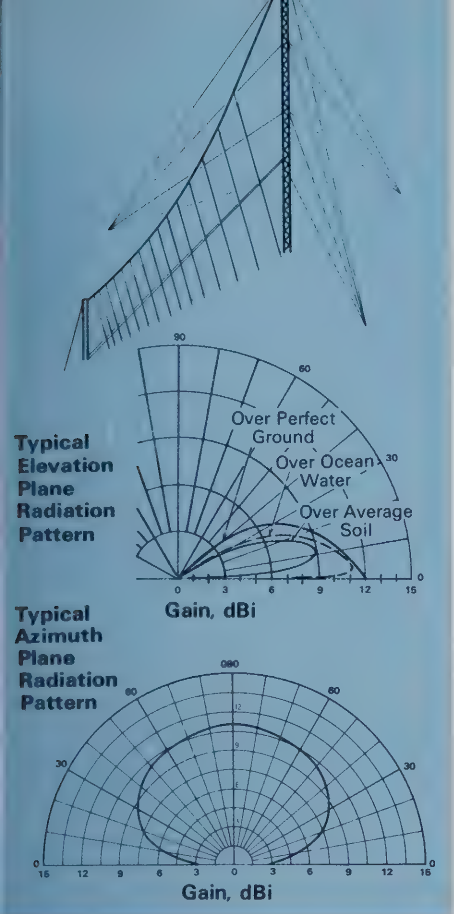
For further details on Type 2701 and 2702 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1424.

Radiation Patterns



Characteristics

Type	HF log-periodic
Frequency Range, MHz	2-32
Power Rating, kW	Up to 20 average, 40 peak
Polarization	Horizontal
VSWR	2.0:1 maximum
Gain, dBi	Type 2701: 10 nominal Type 2702: 11.5 nominal
Front to Back Ratio, dB	Type 2701: 14 Type 2702: 11
Level of Largest Side or Back Lobe Relative to Main Lobe, dB	Type 2701: -14 Type 2702: -11
Wind Survival Rating, mph (km/h)	
Without Ice	100 (160)
With 0.5 in (12 mm) Radial Ice	70 (100)



1703 Series Long-Haul, Log-Periodic Antennas

General Description

The 1703 Series Antennas are designed to provide transmitting and receiving service for HF circuits from 750 to 4,000 miles. Antenna gain is concentrated at the best elevation angles for circuits of this length, and the angle remains virtually the same regardless of the frequency. The 4-32 MHz range of the largest antenna encompasses all frequencies required on most long-haul circuits. Smaller, more economical antennas, with low-end coverage of 4.6, 5.4 or 6.5 MHz, can be used for circuits which do not require the full 4-32 MHz range.

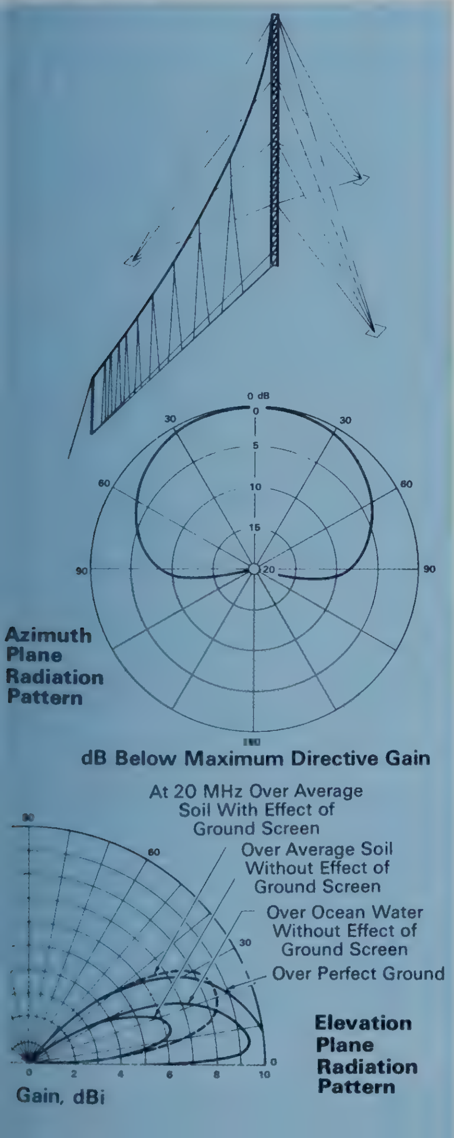
Applications

The 1703 Series Antennas are suited for point-to-point or sector coverage at long distances.

For further details on Type 1703 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1417.

Characteristics

Type	HF log-periodic	
Frequency Range, MHz	4 types: 1703-104	4.0-32 MHz
	1703-103	4.6-32 MHz
	1703-102	5.4-32 MHz
	1703-101	6.5-32 MHz
Power Rating, kW	20 average, 40 peak	
Polarization	Vertical	
VSWR	2.0:1 maximum	
Gain, dBi	11 dB nominal over perfect ground	
Wind Survival Rating, mph (km/h)		
Without Ice	100 (160)	
With 0.5 in (12 mm) Radial Ice	70 (100)	



2726 Series Vertically Polarized Log-Periodic Antennas

General Description

The 2726 Series Antennas are a family of monopole, log-periodic arrays, the most economic configuration which can efficiently radiate at broadband HF frequencies as low as 2.5 MHz. The antennas are intended for either point-to-point communications or sector broadcast.

Radiation patterns, characterized by a high-gain lobe directed close to the horizon, are nearly constant at all operating frequencies. The vertical beamwidth is sufficiently narrow to provide high directive gain, yet broad enough to encompass the range of take-off angles required by diverse ionospheric conditions. Side and back lobes are virtually absent, thereby minimizing off-path interference.

Features

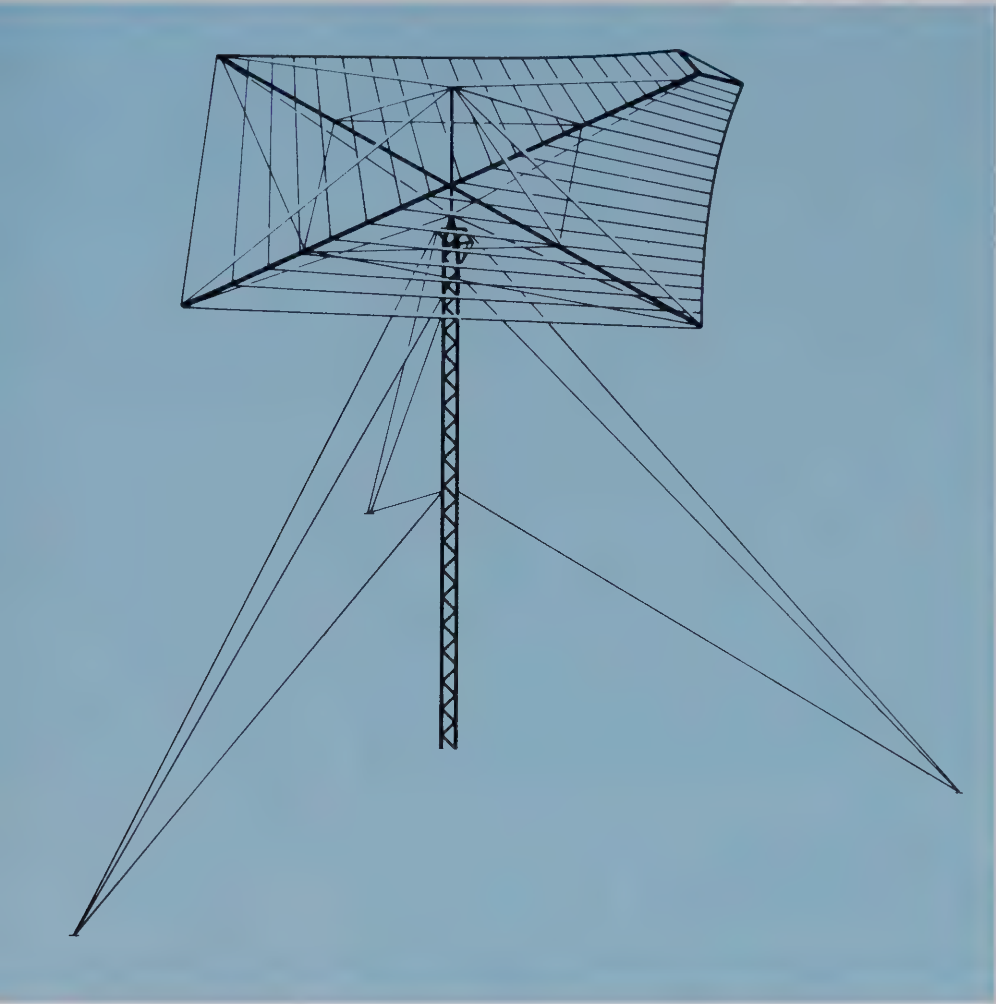
Strength and Durability. The 2726 Series Antennas have been carefully designed to create a light, strong, resilient structure and will operate for long periods in harsh environments. Radiators are high-strength bronze wire. The supporting catenary is fiberglass rod bonded to manganese-bronze end fittings. All materials have been selected for maximum resistance to corrosive environments, such as salt spray, tropical locations and industrial regions.

The 2726 Series Antennas are supplied complete with Ground Screen Kit.

For further details on Type 2726 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1426.

Characteristics

Type	HF monopole log-periodic
Frequency Range, MHz	2.5-32 MHz
Power Rating, kW	Up to 10 average, 20 peak
Polarization	Vertical
VSWR	2.0:1 maximum
Gain, dBi	Greater than 10 over perfect ground
Wind Survival Rating, mph (km/h)	
Without Ice	120 (190)
With 0.5 in (12 mm) Radial Ice	100 (160)



2731 Series Rotatable Log-Periodic Antennas

General Description

The 2731 Series RLPA Antennas are comprised of wire radiators on an unusually strong and light-weight support structure. These radiators are full electrical length, providing very high efficiency. The radiator curtains are also offered in versions with optional electrical loading permitting operation down to 2 MHz, with reduced efficiency and with the pattern tending to become high angle omnidirectional.

Construction

Features. The 2731 Series Antennas are the most cost-effective of their class. The electrical and structural designs are based upon over 15 years of experience. The antennas are fabricated of materials that have proven records of long life through use in every conceivable environment.

Rotation System

The 2731 Series Antennas may be used without a rotator for fixed direction services, where their compact, single-mast construction is advantageous.

The optional, electrical rotator system incorporates a field-proven design with extra heavy-duty chain drive.

The rotators of the 2731 Series Antennas utilize digital controls which provide improved operation at greater control point distances. Antenna bearing data and proper operation is monitored and displayed at each control point.

Remote Control Systems

Master Control Unit (local control panel), normally located within the equipment room, is connected by two shielded, twisted pairs (up to 4,000 ft (1220 m)) to the antenna motor control box located at the antenna mast base. This box houses the necessary circuits and relays to control the starting and stopping of the rotator motor which is located at the top of the mast. Azimuth position, sensed at the rotator, is processed and fed back through the motor control box to the local control panel, where selection of desired azimuth is made. Direction is indicated by a 3-digit LED display.

Extended Remote Control Unit (ERC), similar to the local control panel, allows the operating location of the 2731 Series Antennas to be extended to any distance which can be serviced by a voice-grade telecommunications circuit. Telephone lines or suitable audio channels on a radio circuit may be used. Identical control and indications are available at this ERC panel as are present at the local panel. Line isolation transformers are available to meet local PTT regulations as an option. A primary application is to relocate the operation of a receiving and transmitting antenna from remote sites to a central operations building.

Characteristics

Polarization	Horizontal	Wind & Ice Capabilities Survival Rating, mph (km/h)	
Gain, 4-30 MHz	10 dBi nominal	Without Ice	140 (225)
Directional Gain, 2-4 MHz	8 dBi nominal	With 1/4 in (6.35 mm) Radial Ice	100 (160)
Front to Back Ratio	14 dB nominal	Rotation*	360°
Azimuth Beamwidth (at half power points)	70° nominal	Tower Height	100 ft (30 m)
Cross Polarization	20 dB nominal	AC Power Required	115/230VAC 50/60 Hz, 2 KVA
VSWR	2:1		

*Available without rotator and control for fixed bearing operation.

Tower Lighting

A kit of lighting units is available for installation on the 2731 Series Antennas. The units provide obstruction lighting to meet all federal and commercial specifications. Lighting kits are typically required when a 2731 Series Antenna is installed near an airport.

Erection Equipment (Optional)

Erection Kit with Manual Winch. Includes manual winch, gin pole, stabilization guys and rigging equipment.

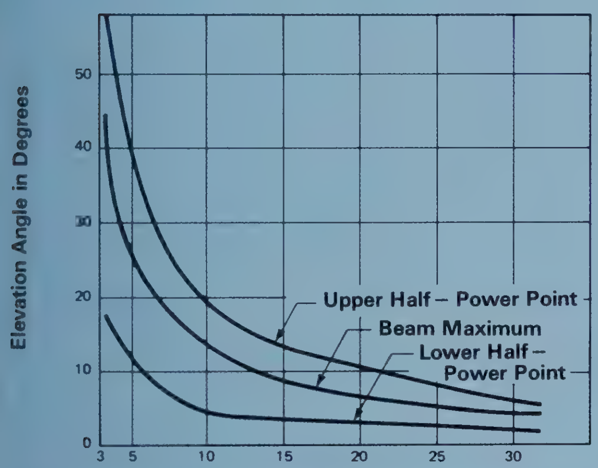
Erection Kit with 115VAC, 60 Hz Electrical Winch. Includes same as above with 115VAC, 60 Hz electric winch.

Erection Kit with 230VAC, 50 Hz Electric Winch. Includes same as above with 230VAC, 50 Hz electric winch.

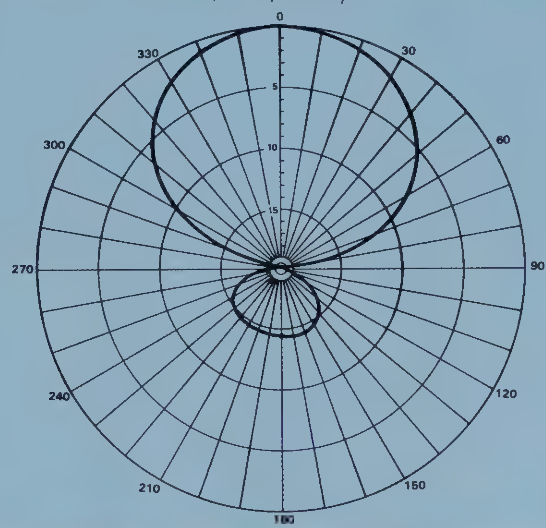
Rigging Tool Kit. For tower assembly and guy tensioning.

For further details on Type 2731 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1423.

Typical Elevation Plane Radiation Pattern



Typical Azimuth Plane Radiation Pattern
(all frequencies)



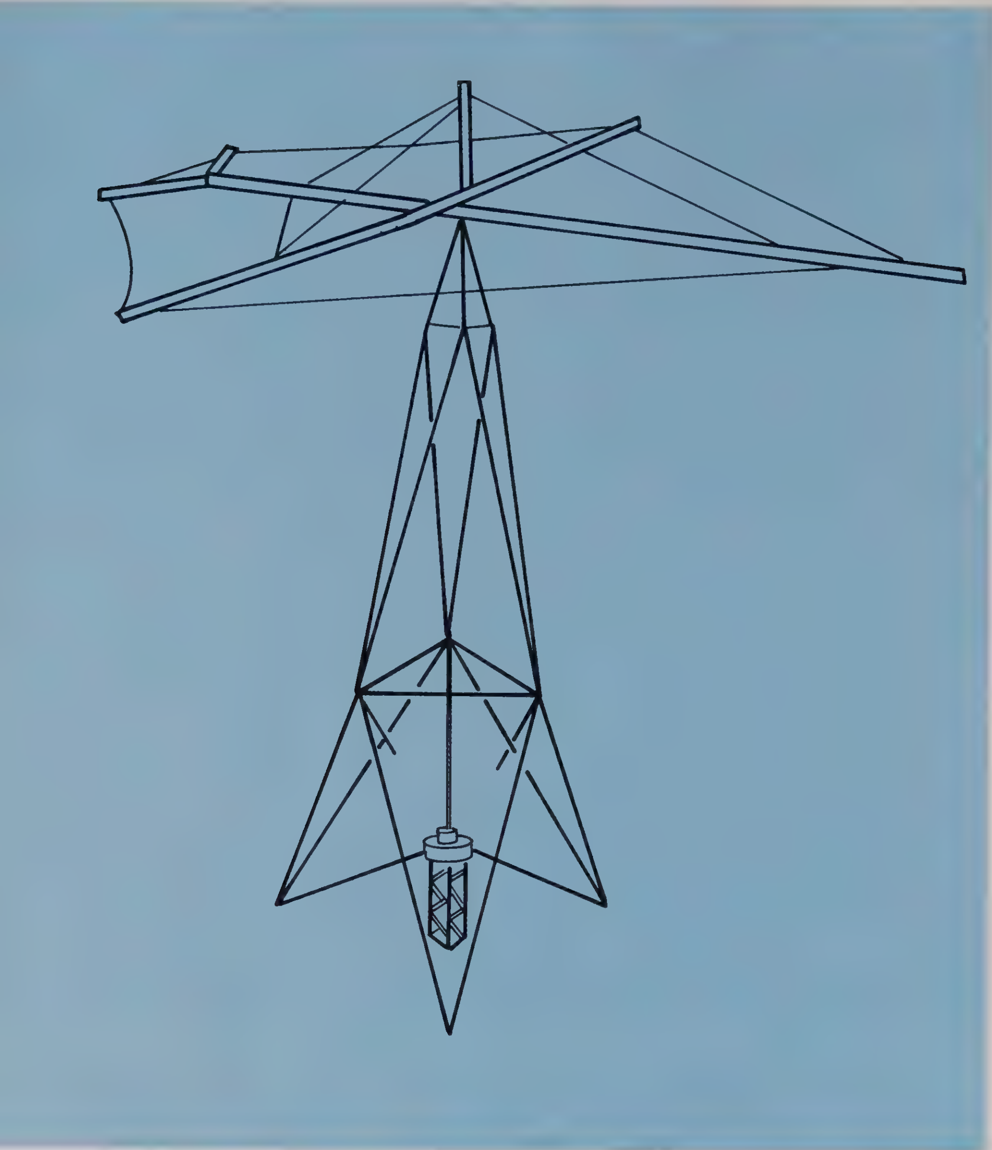
Scale in dB relative to beam maximum

Ordering Information

Type Number*	Freq. Range MHz	Power kW	Input Connector Female	Gain, dBi	F/B Ratio dB	VSWR max.	Efficiency, Percent	Turning Radius ft (m)
2731-1-1	4-30	25	3-1/8″ EIA	10 to 12	14	2.0	98	49 (14.9)
2731-1-2	4-30	10	1-5/8″ EIA	10 to 12	14	2.0	98	49 (14.9)
2731-1-3	4-30	5	7/8″ EIA	10 to 12	14	2.0	98	49 (14.9)
2731-1-4	4-30	1	Type N Jack	10 to 12	14	2.0	98	49 (14.9)
2731-11-41	2-30†	Receive	Type N Jack	directional gain 7 to 12	up to 14	2.0	90-98 (4.0-30 MHz) 25-90 (3.0-4.0 MHz) 10-25 (2.0-3.0 MHz)	49 (14.9)
2731-11-42	2-30†	1	Type N Jack	directional gain 7 to 12	up to 14	2.0	90-98 (4.0-30 MHz) 25-90 (3.0-4.0 MHz) 10-25 (2.0-3.0 MHz)	49 (14.9)
2731-2-1	5.8-30	25	3-1/8″ EIA	10	14	2.0	98	34 (10.3)
2731-2-2	5.8-30	10	1-5/8″ EIA	10	14	2.0	98	34 (10.3)
2731-2-3	5.8-30	5	7/8″ EIA	10	14	2.0	98	34 (10.3)
2731-2-4	5.8-30	1	Type N Jack	10	14	2.0	98	34 (10.3)
2731-21-41	2-30†	Receive	Type N Jack	directional gain 5 to 12	up to 14	2.0	90-98 (5.8-30 MHz) 25-90 (3.0-5.8 MHz) 6-25 (2.0-3.0 MHz)	34 (10.3)
2731-21-42	2-30†	1	Type N Jack	directional gain 5 to 12	up to 14	2.0	90-98 (5.8-30 MHz) 25-90 (3.0-5.8 MHz) 6-25 (2.0-3.0 MHz)	34 (10.3)

*Rotation option must also be specified: **1** without rotation for fixed azimuth; **2** with rotation.

†Electrically loaded.



2004 Series Compact Rooftop Rotatable Log-Periodic Antennas (RLPA)

General Description

The 2004 Series general purpose rooftop antenna provides both private and governmental organizations efficient directed communications capability. Embassies, airports, headquarters buildings, oil companies and other similar organizations utilize this compact rotatable array.

Application

In many cases, 2004 Series Antennas are installed on the roofs of buildings which are pitched or have many obstructions. The reduced turning radius of 23 ft (7 m) decreases the chance of physical interference.

The arrays are designed with fully efficient half-wave radiators. There is no electrical loading on the basic types. The wire radiators are sloped forward to be less obtrusive and so require less turning room than the conventional tubular construction antenna arrays.

The 2004 Series Antennas are horizontally polarized, conservatively rated for full power with a continuous duty cycle and can withstand 100 mph (160 km/h) wind and 50 mph (80 km/h) wind with 1/2 in (13 mm) ice.

Support Mast Options

A sturdy, self-supporting articulated tower (SSAT) can be used in the 23 ft (7 m) or 33 ft (10 m) versions for rapid installation in a confined area. With erecting hardware installed, the permanent SSAT can elevate the 2004 Series Antennas in three minutes.

Other support masts include the fixed or guyed 23 ft (7 m), 33 ft (10 m) or 43 ft (13.1 m) rooftop versions, or ground masts which range from 23 ft (7 m) to 78 ft (24 m).

Rotator Unit

Type 2004 Series RLPA antennas are supplied with a heavy-duty electrical rotator unit. Antennas may be ordered, however, without the rotator if a fixed bearing system is all that is required.

The rotator mounts within the tripod at the top of the mast tower. The remote control panel is connected by multicore power and control cable to the rotator unit. An extended remote control (ERC) system can be supplied to special order.

Extended Frequency Capability

As an option, the 6.2 MHz version antenna is offered with its lowest operating frequency extended down to 2.0 MHz through use of a suitable balun and electrical loading.

Optional Accessories

Control and power cable

Erection kit

Tower lighting kit

Paint kit

Spares kits

For further details on Type 2004 antennas, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1423.

Ordering Information

Type Number*	Freq. Range MHz	Power Rating kW Average	Power Rating kW Peak	Azimuth Beam Width	Input Connector	Gain	F/B Ratio	VSWR nom.**	Freq. Band MHz	Efficiency Percent	Turning Radius ft (m)
2004-2	7.5-30	1	2	70°	50 ohm Type N Jack	8 dBi @ 7.5 MHz 12 dBi @ 30 MHz	12	2.0:1	7.5-30	98 No Electrical Loading	22.8 (6.95)
2004-3	6.2-30	1	2	70°	50 ohm Type N Jack	7 dBi @ 6.2 MHz 12 dBi @ 30 MHz	12	2.0:1	6.2-30	98 No Electrical Loading	26.0 (7.9)
2004-31	2.0-30	Receive Only		70° above 6 MHz	50 ohm Type N Jack	7 dBi @ 6.2 MHz 12 dBi @ 30 MHz	12	2.0:1	6.2-30 5.4-6.2 4.4-5.4 2.0-4.4	90 to 98 50 to 90 25 to 50 5 to 25	26.0 (7.9)
2004-32	2.0-30	1	2	70° above 6 MHz	50 ohm Type N Jack	7 dBi @ 6.2 MHz 12 dBi @ 30 MHz	12	2.0:1	6.2-30 5.4-6.2 4.4-5.4 2.0-4.4	90 to 98 50 to 90 25 to 50 5 to 25	26.0 (7.9)
2004-4	10.0-30	1	2	70° above 6 MHz	50 ohm Type N Jack	10 dBi @ 10 MHz 12 dBi at 30 MHz	12	2.0:1	10-30	98 No Electrical Loading	17.76 (5.4)

*Complete type number requires addition of mast and rotator option suffix from following tables.

**VSWR depends upon the height of the array above ground and the influence of unknown adverse factors in build-up areas, such as roof-tops where the antenna may be installed.

Rotator Option Table

Without Rotator	Fixed Azimuth (-F)
With Rotator	Rack Mounted Control Unit (-R)
With Rotator	Desk Mounted Control Unit (-D)

Mast Option Table

Masts	Height* ft (m)	Roof Mount	Ground Mount
Guyed 17" Face Steel Tower	23 (7.0)	-11	-21
	33 (10.0)	-12	-22
	43 (13.1)	-13	-23
	63 (19.2)	—	-24
	78 (23.8)	—	-25
Model 4000 SSAT (Self-Supporting Articulated Tower)	23 (7.0)	-14	-26
	33 (10.0)	-15	-27

*Overall height includes triangular tower top.

HF Baluns

- Reliable design – no derating from –40°C to +50°C
- Wide frequency ranges (2-32 MHz)
- Natural convection cooling
- Better than 5% terminal balance to ground
- 1.2:1 maximum insertion VSWR
- High average-to-peak rating
- 97% efficiency
- Minimal insertion loss

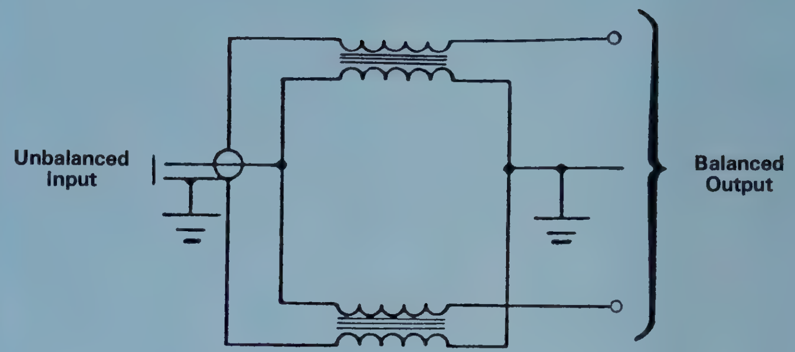
General Description

Wideband HF baluns are ferrite core devices, which provide a highly efficient, bi-directional transfer from unbalanced coaxial mode to balanced open-wire mode. Standard baluns are available in a wide range of power-handling capabilities and impedance ratio transformation, encompassing receive levels up to 50 kW, average; 200 kW, peak.

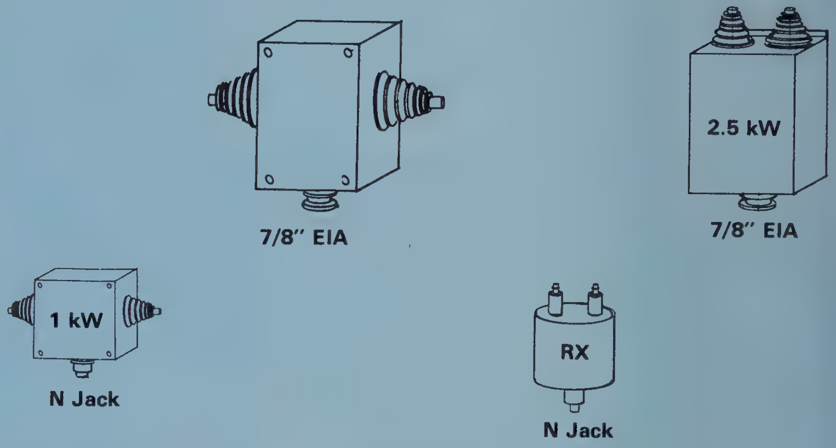
Application

- Coaxial transmission line to balanced input of antenna (e.g.; log-periodics – typically 200 or 300 ohm balanced; rhombics – typically 600 ohm).
- Coaxial output of transmitter or station-switching matrix to long-distance, open-wire lines of the antenna farm (e.g.; 50 ohm unbalanced to 600 ohm balanced).
- Open wire feeder to antenna with coaxial unbalanced input – MONOCONE™ or monopole.

Simplified Schematic of Baluns

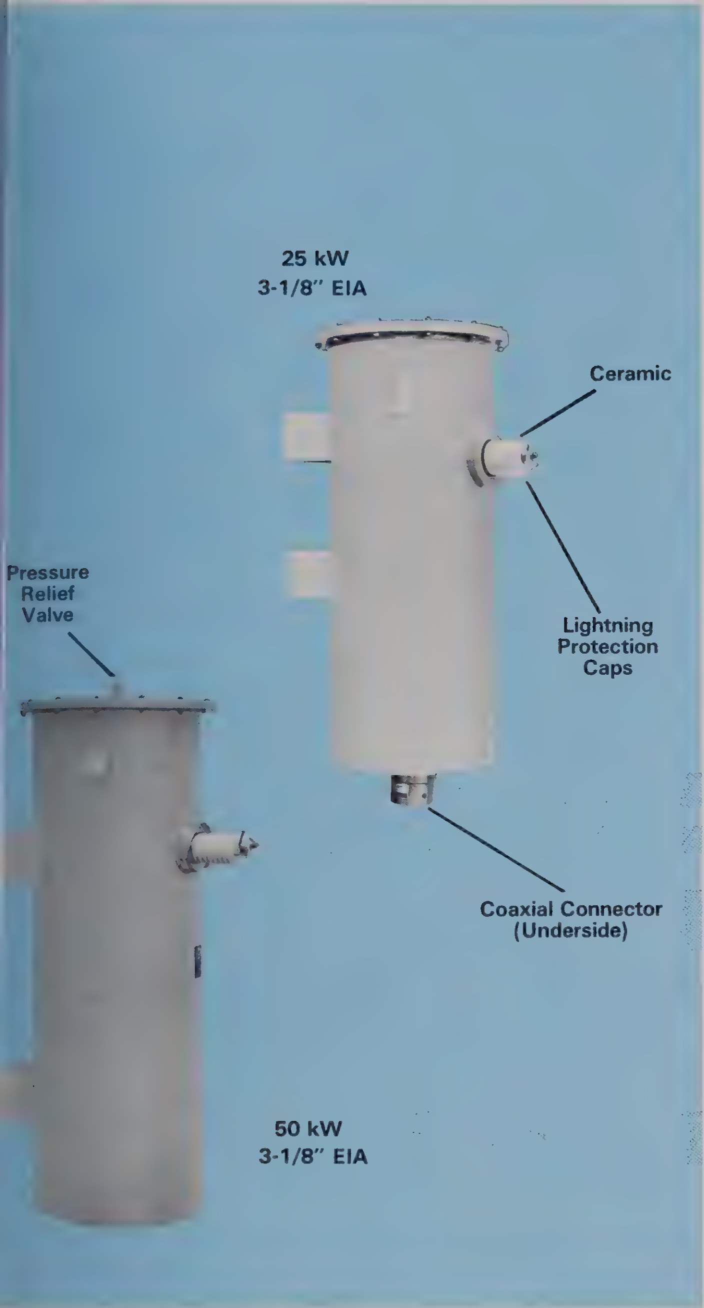


Balun Configurations



Ordering Information

Power, kW Average	Peak	Frequency Range MHz	Input Connector Female	Type Number — Impedance Ratio Unbalanced-to-Balanced, ohms 50-150	50-100	50-300	50-600
Rx (50w)	Rx (100w)	1.0 – 32	Type N Jack	—	575-1	575-3	575-5
1	2	2.0 – 32	Type N Jack	—	365-2	365-1	—
2.5	30	2.0 – 32	—	—	534-1	—	—
2.5	30	4.0 – 32	7/8" EIA	570-1	534-2	562-1	576-1
5.0	10	2.0 – 30	7/8" EIA	—	465-1	—	—
10.0	60	2.0 – 30	1-5/8" EIA	573-1	546-1	544-1	545-2
25.0	100	2.0 – 30	3-1/8" EIA	574-1	542-1	558-1	555-8
50.0	200	3.0 – 32	3-1/8" EIA	—	—	543-1	—



Impedance Transformers

General Description

These ferrite core devices, similar in size to the 25 kW baluns, are balanced-to-balanced ratio frequency transformers which offer high performance. They are to be used for balanced 600 ohm transmission lines to a balanced antenna input, with outdoor mounting.

Characteristics

Input/Output Connector	Alumina Ceramic Feed-Thru bushings 3/8"-24 stud
Power, kW	25 average 100 peak
Frequency Range, MHz	2-32
Cooling	Natural convection, oil filled
Size, in (mm)	16 (406) x 20-1/2 (521) x 35-1/2 (902)
Weight, lb (kg)	176 (80)

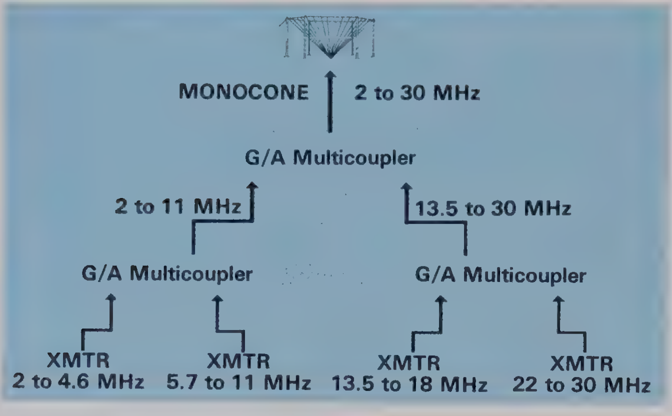
Ordering Information

Power, kW		Frequency Range	Type Number Impedance Ratio Balanced-to-Balanced, ohms		
Average	Peak	MHz	600-150	600-200	600-300
25	100	2.0 – 32	**567-1**	**568-1**	**569-1**

HF Receiving Multicouplers

Andrew offers a range of passive multicouplers which simply divide the signal; the resultant 3 dB loss for each split is in no way significant, since the limiting atmospheric noise from the antenna is also reduced.

No. of Outputs	2.0 – 32 MHz Freq. Range (1.65 – 32 Usable) Type No.	
2	**356-1**	50 ohm
4	**356-2**	BNC
8	**356-3**	Connectors



HF Transmitting Multicouplers

- 2-32 MHz frequency range
- 20 kW average, 40 kW peak power rating
- Natural air convection cooling
- 50 ohm coaxial input impedance
- 1.2:1 maximum insertion VSWR
- 3.0:1 allowable load VSWR
- 97% efficiency
- 30 dB port-to-port isolation (with matched load)
- −40°C to +50°C ambient temperature

General Description

The transmitting multicoupler connects two HF transmitters to a single broadband antenna, allowing each transmitter to operate simultaneously without significant insertion loss. Each transmitter operates as though the other were not in the circuit – one performing in the lower portion of the antenna's frequency range and the other in the upper portion. A narrow "guard channel" of unusable frequencies separates the two channels.

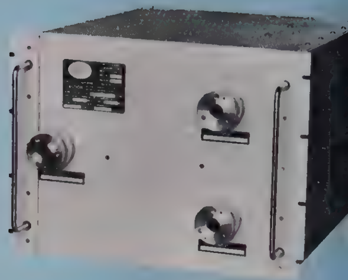
A multicoupler consists of two bandpass filters and an output crossover network. Each filter is a network of passive, fixed-tuned elements which are permanently adjusted to pass all frequencies within the particular channel and to reject all frequencies allocated to the opposite channel. Consequently, the transmitter frequency can be freely shifted within its respective channel without retuning the multicoupler.

Applications

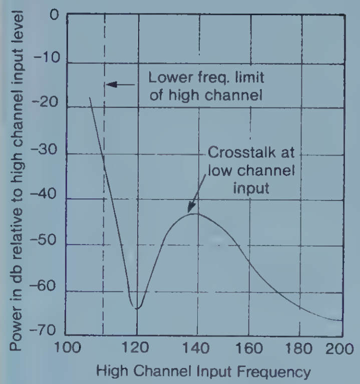
The use of transmitting multicouplers in a communication network makes possible the use of the full capability of modern broadband antennas. When receiving stations lie at differing distances within the directional pattern of a single antenna, the use of a multicoupler permits simultaneous use of a "long-distance" and a "short-distance" frequency, accommodating a second HF communication circuit on the antenna. The Model 520F, intended for shipboard applications, is in all respects electrically identical to the Model 520G. For new installations, consideration should be given to use of the Series 3000 SPIRA-CONE™ antenna which permits transmissions simultaneously on high- and low-angle modes without frequency restriction.

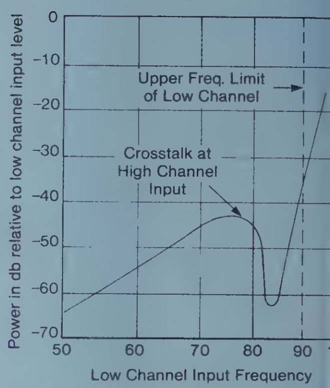
Multicouplers may be cascaded to permit the use of more than two transmitters with one broadband antenna. Their power ratings may be intermixed to obtain the lowest cost for a system.

Type 520G



Type 579





Typical isolation between channels. So that the graph will be applicable to all models, frequency is related to the point where the 2 to 32 MHz range is divided. Note: 30 dB minimum isolation has long been the criteria for the HF antenna siting.

HF Characteristics

Type Number	Power per Channel Avg.	Power per Channel Peak	Crossover Band*	Std. Connectors In	Std. Connectors Out
579	2.5 kW	5 kW	16.5%	7/8″	7/8″
520G	10.0 kW	20 kW	16.5%	1-5/8″	1-5/8″
557	20 kW	40 kW	16.5%	1-5/8″	3-1/8″

*Upper limit of the lower channel must be at least this percentage below the lower limit of the upper channel.

Typical Ranges of Lower and Upper Channels

10 kW Type Numbers	Lower Channel	Upper Channel
520G-1	2.0 to 3.5 MHz	4.2 to 32.0 MHz
520G-7	2.0 to 4.75 MHz	5.7 to 32.0 MHz
520G-10	2.0 to 5.55 MHz	6.7 to 32.0 MHz
520G-6	2.0 to 7.30 MHz	8.8 to 32.0 MHz
520G-2	2.0 to 8.15 MHz	9.8 to 32.0 MHz
520G-9	2.0 to 9.55 MHz	11.45 to 32.0 MHz
520G-8	2.0 to 11.25 MHz	13.5 to 32.0 MHz
520G-3	2.0 to 12.5 MHz	15.5 to 32.0 MHz
520G-11	2.0 to 12.85 MHz	15.4 to 32.0 MHz
520G-5	2.0 to 13.4 MHz	16.1 to 32.0 MHz
520G-4	2.0 to 18.35 MHz	22.0 to 32.0 MHz
520G-15	2.0 to 14.1 MHz	16.9 to 32.0 MHz

CQS-100
Channel Quality Sounder
Real Time, High-Frequency Management System

General Description

The CQS is a real-time, channel-quality sounder system which monitors HF (2-40 MHz) skywave transmission characteristics over medium- to long-distance communication circuits. From the allocated channels, it selects the one most suitable for the transmission of digital data or voice, and recommends this channel to the operator for use. Alternatively, the CQS can be directly connected to control the communications system without operator intervention.

Several alternative system configurations can be provided for both fixed and mobile applications, ranging from a basic simplex system to more complex remotely controlled simplex or duplex systems which can be integrated into existing communication networks.

Features

- Automatically recommends most suitable communications channel.
- Non-interfering to other users (transmits typically less than 5 watts on assigned frequencies only).
- Channel evaluation algorithm accounts for modem specific signal-to-noise, doppler and time delay spread sensitivity, and estimates bit error rate (BER).
- Built-In Test Equipment (BITE) to detect and report equipment faults to LRU level.
- Simplex, duplex and network configurations.

For further information, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1364B.

Functional Characteristics

Basic System	One CQS(T) transmitter set and one CQS(R) receiver set
Frequency Range	2-40 MHz
Number of Channels	Up to 16
Sounding Time	30 seconds nominal per channel
Input Parameters	Modem-type, performance threshold, current channel, communication system frequency change time, system configuration
Operator Interface	20 button keypad and electro-luminescent display
Channel Recommendation	Based upon BER Estimation, system frequency change time, trend analysis and selected quality threshold
Bit Error Rate (BER) Estimator	Based on S/N + I, doppler and time delay spreads for the specific modem in use
Power Output	Typically 1-5w user selectable up to 50 watt to allow for loss in diplexers if used
Line Voltage	115/240 VAC selectable, 47-65 Hz

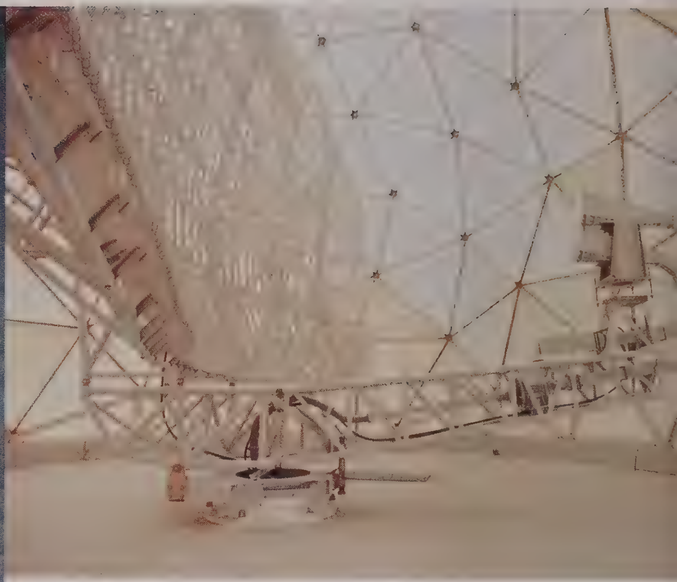
Environmental Characteristics

Temperature, °C (°F)	Operating 5-45 (41-113)
Altitude, ft (m)	Operating to 15,000 (4,600) Non-operating to 40,000 (12,000)
Humidity	5-90%, non-condensing

Dimensions, in (mm) – 19 in Rack Mounting

	Depth	Height
R100 Receiver	21 (525)	7 (176)
T100 Transmitter	21 (525)	7 (176)
FS100 Synthesizer	20 (500)	5.25 (132)
PSU100 Power Supply	10 (250)	7 (176)

MLS Elevation Array under test in anechoic chamber



Andrew L-Band Antenna installed in Carribean area

RAMP Antenna under test

Navigation Aids, Air Traffic, Weather and Tactical Antennas

Andrew produces a wide variety of custom-designed antennas for military and civil use in communications, navigation and air traffic surveillance and weather radar applications.

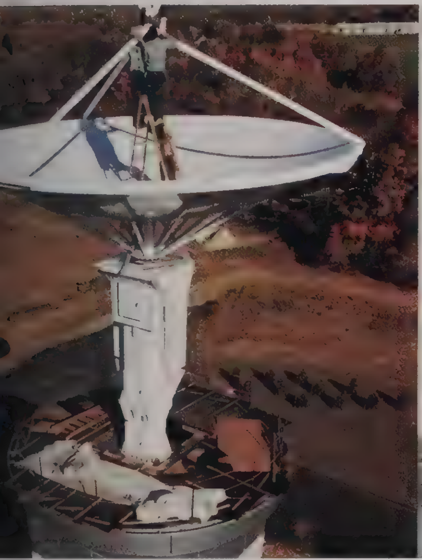
Andrew's reputation was established in the NAVAIDS field with its proven Standard and Doppler VOR antennas. These are printed circuit antenna systems designed to meet stringent Canadian Ministry of Transport (MOT) specifications.

Advanced L-band primary radar reflectors are currently being designed and manufactured by Andrew as part of the Canadian MOT's Radar Modernization Project (RAMP). RAMP will replace existing installations with modular digital units designed to increase the area of coverage and provide more accurate weather and air traffic information with reduced operating costs.

Andrew technology led to the development of a high performance S-band Doppler radar antenna for the Next Generation Radar (NEXRAD) weather radar system being jointly procured in the U.S. by the National Weather Service, the Federal Aviation Administration, and the Department of Defense. Utilizing Doppler radar, the computerized NEXRAD system will be able to determine wind speed, wind direction, precipitation, storm size and intensity more accurately and much earlier than is possible with conventional radar systems. Andrew research capability is now being directed to an advanced version of the NEXRAD technology which will be used to detect windshear and microbursts to improve air travel safety.

An elevation antenna array for the Microwave Landing System (MLS), the next generation aircraft landing system, has been designed and produced by Andrew. Andrew's elevation antenna is a vertical phased array, comprised of 60 radiating horns which precisely meet the FAA specified radiation patterns. The MLS landing system allows aircraft to reach an airport on a number of different glide paths and approaches, providing much greater air traffic flexibility and safety. MLS has been

Doppler VOR installation



NEXRAD Antenna being installed at test site

Radome installation

L-Band Antenna under test

adopted by the International Civil Aviation Organization (ICAO) as the future standard for precision landing systems.

Andrew antennas are designed and built with a dedication to quality. Our manufacturing facilities are capable of meeting the demanding requirements of government and major prime contractors. The quality assurance program meets MIL-Q-9858A, MIL-I-45208A and equivalent international standards.

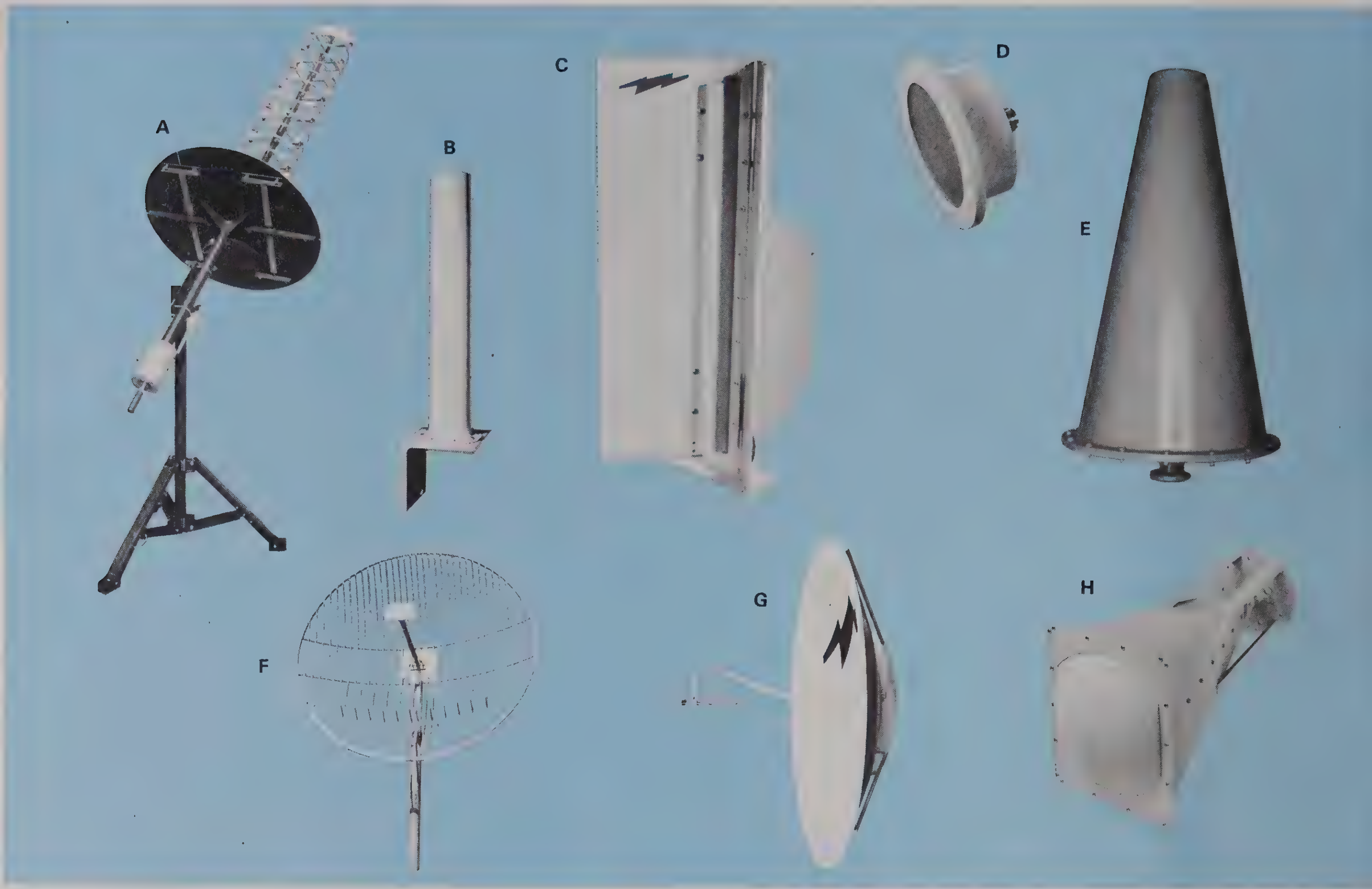
In addition to designing antennas to demanding specifications, Andrew's excellence in manufacturing is idealy suited to the build-to-print of existing designs, particularly in the field of military and tactical antennas. Close tolerances, precision tooling and the latest production techniques allow manufacturing to consistently produce the top quality antennas demanded by government and military users.

Andrew's fully instrumented anechoic chambers and pattern test ranges provide a capability for antenna research, development and the production verification of performance specifications.

With manufacturing facilities in the United States, Canada, United Kingdom and Australia, and with sales offices throughout the world, Andrew can easily fulfill international contracts and provide superior product support around the globe. Most importantly, all Andrew products are built with the uncompromising commitment to technological excellence and customer satisfaction expected from an industry leader.

With its years of experience in designing and building navigation aids, radar antennas and such specialty items as variable beam antennas, dual-beam antennas, broadband antennas, circularly polarized antennas and telemetry antennas, Andrew is well qualified to provide the custom antenna system you need.

Andrew will translate your special requirements into carefully designed, high performance hardware. For further information, contact your local Andrew Sales Office listed inside the back cover.



Andrew Corporation uses its accumulated knowledge and experience to provide efficient, cost-effective solutions for special applications antenna requirements. Specific examples on pages 174-176 are indicative of that capability.

Diverse requirements can be addressed with a wide variety of antenna configurations, including: parabolic reflector, log periodic, helical, bifilar, arrays, conical, discone and helicone. These antenna designs cover a broad range of frequencies from 2 MHz to 40 GHz.

Computer-assisted design (CAD) equipment is used to accurately predict and analyze product performance before construction. Scale models and prototypes are then tested to verify predicted results.

The latest production techniques, including computer-aided manufacturing (CAM) equipment, are used to ensure final products meet all performance requirements. Production models are thoroughly tested before delivery, including full scale pattern range testing when required.

The key to Andrew's success in this area over the years is outstanding quality, quick response and customer service. Andrew is capable of meeting government and military specifications including U.S. military standards, equivalent NATO standards and other international standards.

Ask Andrew about your next special antenna design. We may already have it.

Example Antennas

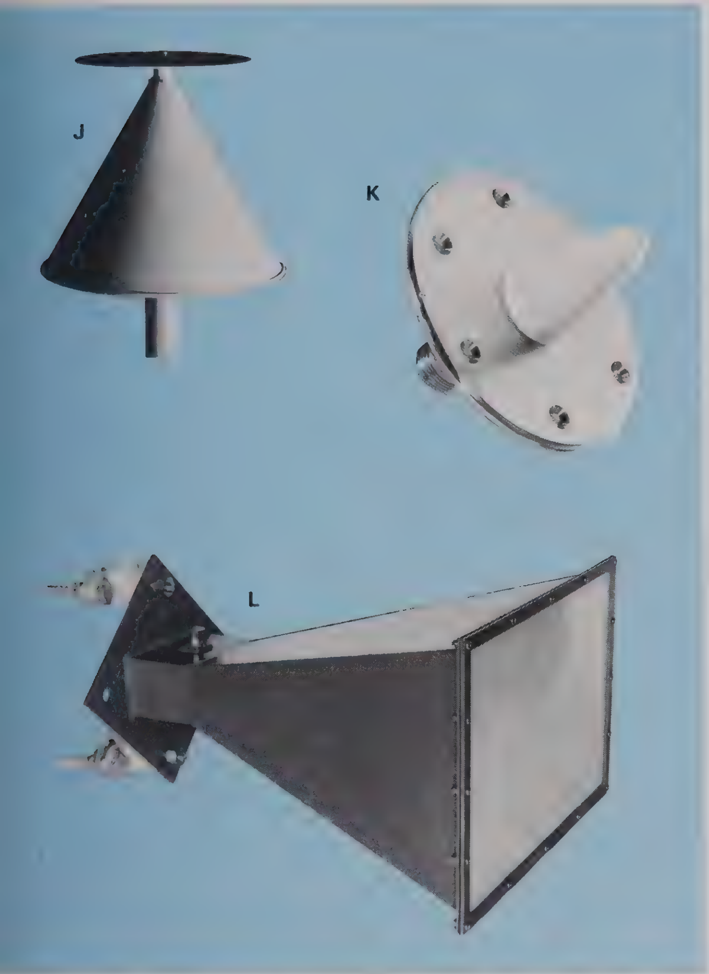
A Type 63305A-5 Bifilar Helical is a rugged, field transportable antenna operating in the 245-315 MHz band, which is widely used for satellite communications. The breakdown construction allows quick assembly from a storage size of approximately 20 x 40 x 40 in (510 x 1020 x 1020 mm). It can be easily deployed in the field or on roof tops to provide either emergency or long term communications paths.

B Type 58700-14 is one of a family of vertically polarized omnidirectional antennas with 8 dBi gain. The low cost, rugged radome and broad band operation make these very popular for many applications such as flight test telemetry. Available in various bands from 1400 to 3000 MHz.

C Type 58437 Variable Beamwidth Antenna is an extremely rugged unit providing 10° of elevation beamwidth and variable azimuth beamwidth between 30° and 120°. The antenna is optimized for the 2920-3080 MHz frequency range, and is used as a transponder antenna in an off-shore oil drilling distance measuring system.

D Type 63200-26 is a high efficiency flat spiral antenna with excellent axial ratio and pattern characteristics. It is one of a large variety of flat spirals operating over various bands between 500 MHz and 8 GHz.

E Type 57585 is a conical spiral antenna with hemispherical coverage. This antenna is used for missile range



command-destruct application. Similar types of antennas are available in either normal or axial mode operation from 150 MHz to 4 GHz, in several bands.

F Type 63100 Dual-Beam Antenna is an extremely rugged and lightweight, dual-beam unit for 1600-1660 MHz frequency range. The antenna provides two slightly off-center beams that cross over at the 2-1/2 dB point which in turn are used for sequential lobing in order to obtain tracking information in the azimuth plane. The elevation pattern of the antenna is cosecant squared eliminating the necessity for elevation tracking. The unit is used for tracking airborne objects, especially drones. The antenna weight is 17 pounds (8 kg) which allows the use of a very small, lightweight positioner.

G Type 60906-5 Six-Foot Broadband Parabolic Antenna is capable of providing dual polarization in the 500-1000 MHz frequency range. With the addition of hybrids, the unit is also capable of providing left- and right-hand circular polarizations. The antenna is used for frequency monitoring, propagation studies, or as a source antenna for pattern testing.

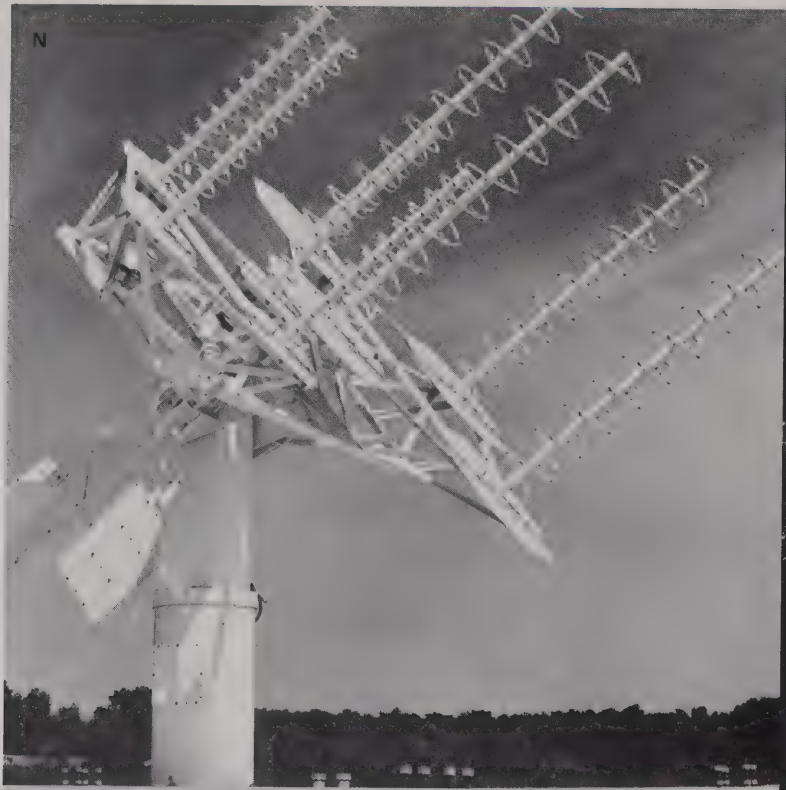
H Type 55243 Broadband Horn Antenna covers the frequency range of 2-8 GHz. The horn is lens corrected and provides a uniform gain increase with frequency. This unit is ideal for surveillance and for antenna pattern ranges as the broadband performance of this antenna eliminates the necessity for several separate antennas.

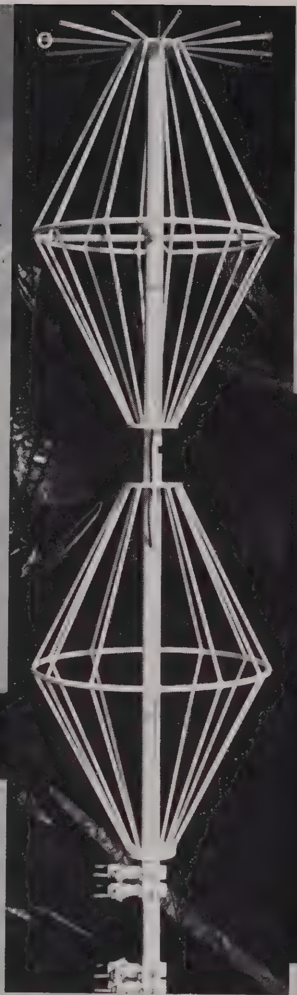
J Type 57756 Discone Antenna provides omnidirectional azimuth coverage in the L through S band frequency range. The antenna offers lightweight yet rugged construction for highly reliable operation under severe environmental conditions. It is ideally suited for monitoring applications or as a base station antenna for ground-to-air communications and telemetry.

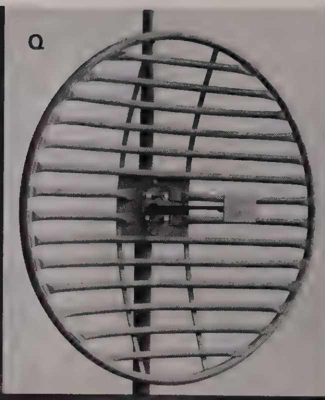
K Type 55070 Airborne Antenna for air-to-ground communications sytems is available in specific bandwidths covering frequency ranges from 0.8 to 13 GHz. Radiation patterns are typical of a quarter wave monopole over ground with a gain of 5 dBi, depending on ground plane to which it is mounted. Its low silhouette design minimizes drag to allow withstanding air speeds up to Mach 2.

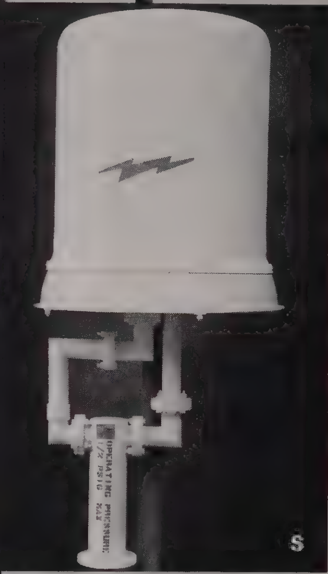
L Type 58135 Horn Antenna covers L and S band telemetry frequencies. The unit is constructed of high strength aluminum alloy, foam filled, completely sealed, and is resistant to extreme environmental conditions. Typical applications include monitoring, portable tracking, gain standard, source antenna and telemetry.

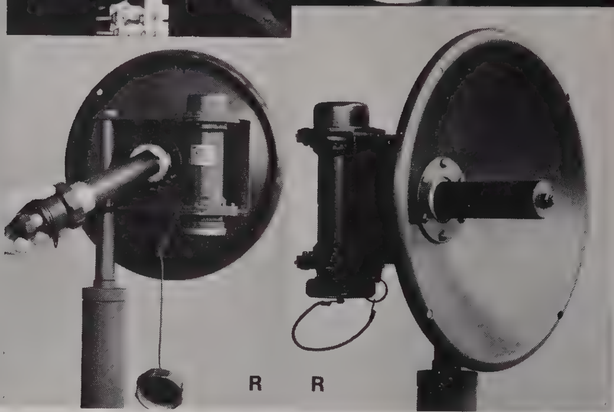
M Type 58111 Satellite Control Antenna was developed for NASA to transmit satellite command signals on frequencies between 148-154 MHz. The unit consists of an array of nine cross-polarized Yagi elements providing any of two linear and two circular polarizations. The antenna has 17.5 dB minimum gain and 15 kW CW minimum power rating.











N High Gain Quad Helical Antenna used aboard instrumentation ships such as for the Apollo Space Program. This antenna transmits at 406-500 MHz and receives at 225-300 MHz.

O Type 55520-3 Omnidirectional Vertically Polarized Truncated Biconical Monopole Antenna operates in the 30-100 MHz frequency range. Other frequency ranges are available.

P Type 63141 Broadband Antenna is representative of a series of antennas developed for radar studies. Each unit is dual-polarized and operates over a complete waveguide bandwidth. E and H-plane patterns are very symmetrical with suppressed side lobe levels. Five units covering the 2.6-18.0 GHz frequency range are available and provide gains ranging from 30-40 dB.

Q Type 63705 is a rugged yet lightweight parabolic grid antenna operating in the 1400-1700 MHz frequency band. The antenna is typically used for MSE battlefield communications.

R Types 103730 and 103731 are 12 inch (305 mm) and 30 inch (760 mm) diameter transportable parabolic antennas for ground mobile battlefield applications in the 4.4 to 5 GHz frequency band. The antennas feature rugged socket mount feeds for quick field assembly and compact storage.

S Type 63609 Hemispherical Antenna provides high power (10 kW.) circularly polarized overhead coverage. The unit is typically used for command destruct systems operating in the frequency range of 400-425 MHz.

Andrew offers a complete range of HELIAX® elliptical, rigid rectangular and rigid circular waveguides for use in terrestrial microwave and earth station antenna systems.

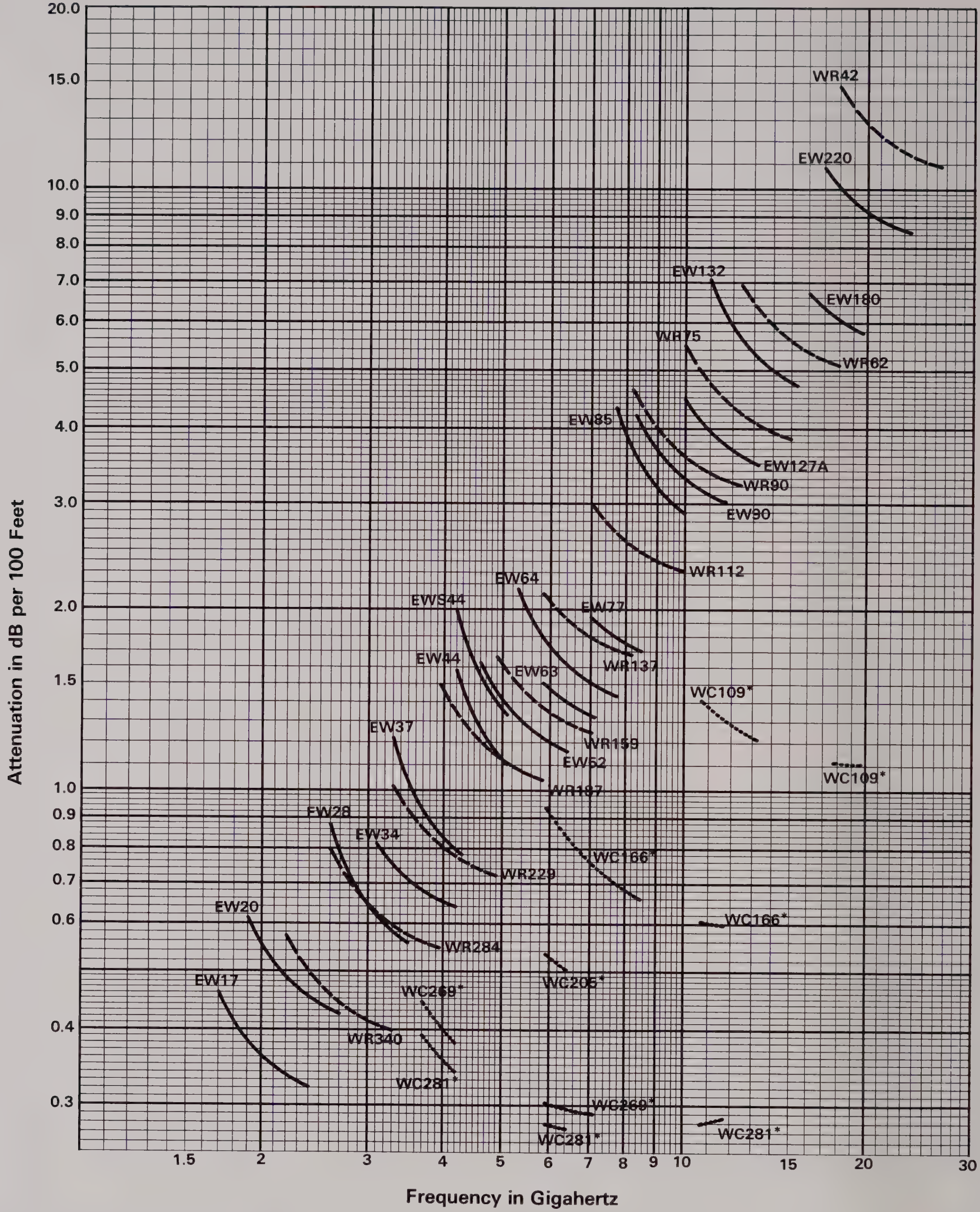
HELIAX Elliptical Waveguide is the recommended feeder for most microwave antenna systems in the 3.4 – 23.6 GHz frequency range. Long, continuous, flexible lengths result in easier and less costly system planning and installation compared with rigid waveguides. The performance and reliability of HELIAX elliptical waveguide have been proven in thousands of microwave systems. The corrugated copper wall gives HELIAX elliptical waveguide excellent crush strength, good flexibility and optimum stability. A rugged black polyethylene jacket provides protection during handling and installation. Assemblies consist of waveguide cut to a specified length and terminated with connectors. Alternatively, bulk lengths may be ordered and individual feeders cut to length on site prior to installation. HELIAX elliptical waveguides are described on pages 180-194.

Rectangular Waveguide components such as elbows, twists, pressure windows, and flex-twists are used in elliptical and circular waveguide systems for connections with the antenna and radio equipment. Rectangular waveguide also may be used for short feeder systems where space is limited. A full range of components for the 3.3 – 26.5 GHz frequency bands is offered. Rectangular waveguides are described on pages 202-209.

Circular Waveguide minimizes feeder attenuation and is particularly suited for long vertical waveguide runs to tower-mounted antennas. A single waveguide run can carry two polarizations with 30 dB minimum isolation. Circular waveguide is recommended for systems where lower attenuation is critical or where multi-band capability is needed. The economic choice between elliptical and circular waveguides depends on total antenna and feeder system equipment, transportation, installation and tower costs. Circular waveguides are described on pages 196-201.

Recommended Waveguide Sizes

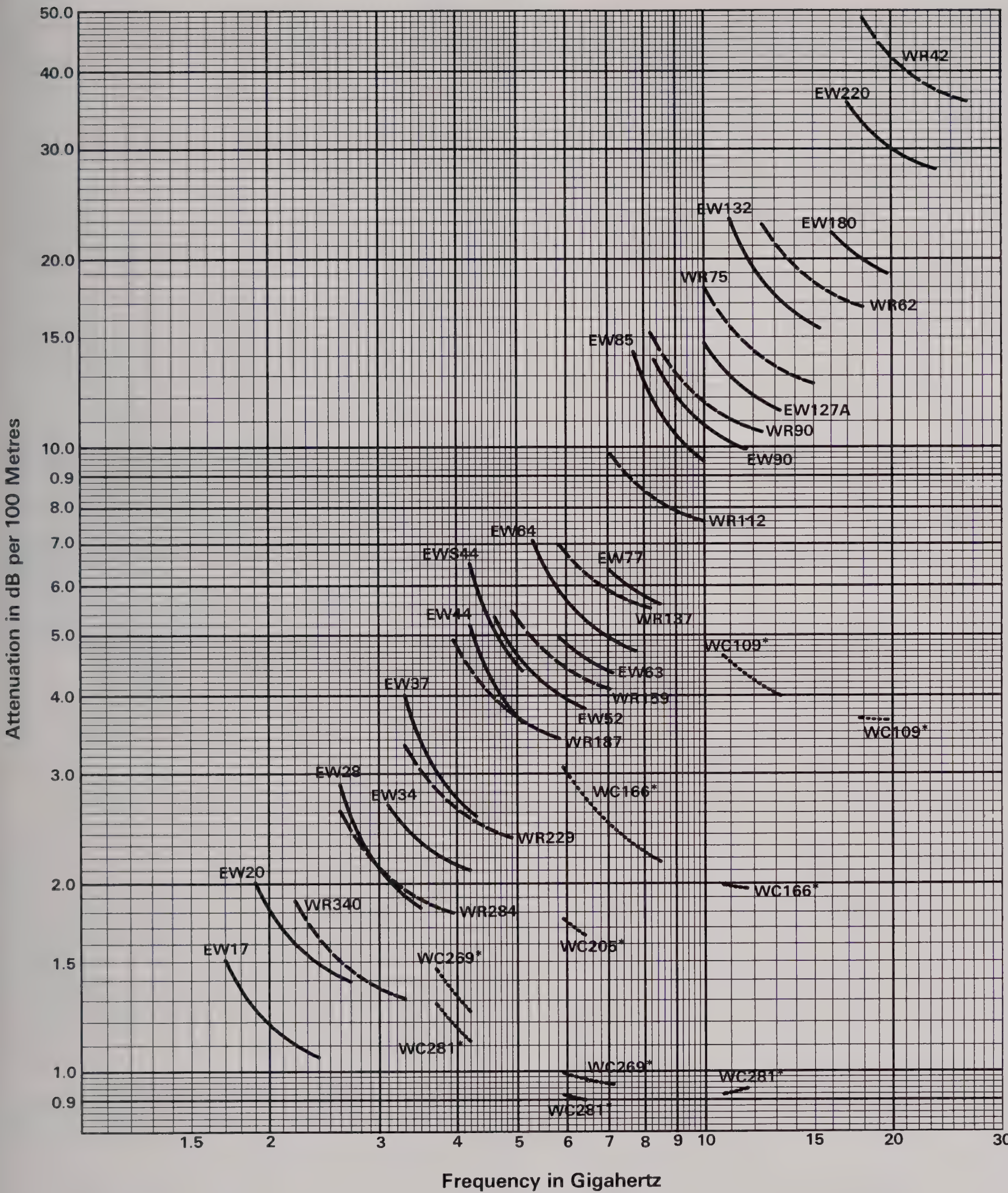
Frequency Band, GHz	HELIAX Elliptical Waveguide	Rectangular Waveguide	Circular Waveguide
1.7-2.3	EW17, EWP17	—	—
2.5-2.7	EW20	—	—
2.9-3.5	EW28	—	—
3.58-4.2	EW34, EWP34	WR229	WC281
	EW37, EWP37 & EWP37S	—	WC269
4.4-5.0	EW44, EWP44, & EWS44	WR187	—
5.6-6.425	EW52, EWP52	WR159 WR137	—
5.925-6.425	EW52, EWP52 & EWP52S	WR159 WR137	WC281 WC269 WC205 WC166
6.425-7.125	EW63, EWP63 & EWP63S	WR137	WC281 WC269 WC166
7.125-7.750	EW64, EWP64	WR137 WR112	WC166
7.125-8.5	EW77, EWP77	WR112	WC166
8.5-9.8	EW85	WR90 WR112	—
10.5-10.7	EW90, EWP90	WR90	—
10.7-11.7	EW90, EWP90 & EWP90S	WR90	WC109
11.7-13.25	EW127A, & EWP127A	WR75	WC109
14.0-14.5	EW132, EWP132	WR75	—
14.5-15.35	EW132, EWP132	WR62	—
17.7-19.7	EW180, EWP180	WR42	WC109
21.2-23.6	EW220, EWP220	WR42	—



Attenuation curves based on:
VSWR 1.0
Ambient Temperature 24°C (75°F)
High Conductivity Copper

The above attenuation curves are guaranteed within ±5%

*Does not include transition or network losses. See pages 196 and 198.



Attenuation curves based on:
VSWR 1.0
Ambient Temperature 24°C (75°F)
High Conductivity Copper

The above attenuation curves are guaranteed within ±5%

*Does not include transition or network losses. See pages 196 and 198.

Advantages

HELIAX* Elliptical Waveguide is the optimum choice for most microwave antenna feeder systems. HELIAX is precision-formed of corrugated high-conductivity copper with an elliptical cross section. The corrugated wall gives the waveguide excellent crush strength with light weight, good flexibility, and optimum stability. A rugged black polyethylene jacket provides protection during handling and installation. A full range of waveguide sizes is available for applications from 1.7 to 23.6 GHz.

Low Loss. HELIAX elliptical waveguides are optimized for lowest loss in specific user bands. Attenuation is significantly lower than that of standard rectangular waveguides for these bands..

Long Continuous Lengths. A major advantage of HELIAX elliptical waveguide is its availability in long continuous flexible lengths which can be easily cut to length for any waveguide run, eliminating the need for multiple joints and elbows or flex sections.

Low Installed Cost. HELIAX elliptical waveguide also minimizes detailed waveguide system planning and provides improved electrical performance, lower material cost, and lower installation cost compared with other types of waveguide.

Low Signal Distortion. The elliptical cross section propagates the ${}_{e}TE_{11}$ dominant mode, which is similar to the TE_{10} mode in rectangular waveguide, and operates below the cutoff frequencies of higher order modes. Operating in the frequency band where only the dominant mode can exist eliminates signal distortion due to mode conversion and minimizes VSWR.

Assemblies

HELIAX elliptical waveguide assemblies consist of waveguide cut to a specific length and terminated with connectors on each end. Connectors are transitions from the elliptical to rectangular cross section and incorporate standard rectangular waveguide flanges. Information on flange identification is presented on pages 208 and 209. Connectors are factory installed at no extra charge.

Factory assemblies are available in standard and premium (low VSWR) versions. Super premium versions are available for certain sizes.

*HELIAX is the registered trademark under which flexible elliptical waveguides are sold by Andrew.

HELIAX Elliptical Waveguide Installation

Field Fitted Assemblies

Bulk lengths may be ordered and individual feeders cut to length and connectors installed on site. Connectors can be attached without need of special tools or compounds. Compact flaring tools are available to assure optimum VSWR performance.

VSWR Characteristics

Recommended waveguide and connector assemblies for the commonly used frequency bands are listed in the tables on pages 185-189. VSWR characteristics shown are guaranteed for factory assemblies within the indicated bands. They are also typical for assemblies with field-installed connectors. Performance data for other bands are available on request.

Every length of waveguide is sweep tested before shipment and verified to be at least 0.01 better than the published VSWR specifications. This ensures that the published specifications will be maintained upon delivery to the site. The highly directive Andrew hybrid T reflectometer (see page 195) is used for all factory and field service VSWR measurements for extreme accuracy.

Cutting Tolerance

Waveguide lengths are measured from connector flange face to connector flange face. Standard cutting tolerance is +2%, –0%. Closer tolerances are available on special order.

Fire-Retardant Jacket

HELIAX elliptical waveguide is available with a fire-retardant jacket. For further information, contact your local Andrew sales office listed inside the back cover.

Typical Systems

Example microwave antenna systems using HELIAX elliptical waveguide are described on pages 12 and 13. Typical components and mounting accessories are illustrated.

Pressurization

The waveguide should be maintained under dry air or dry nitrogen pressure to prevent moisture condensation. All sizes are pressurizable to 10 lb/in^2 (70 kPa).

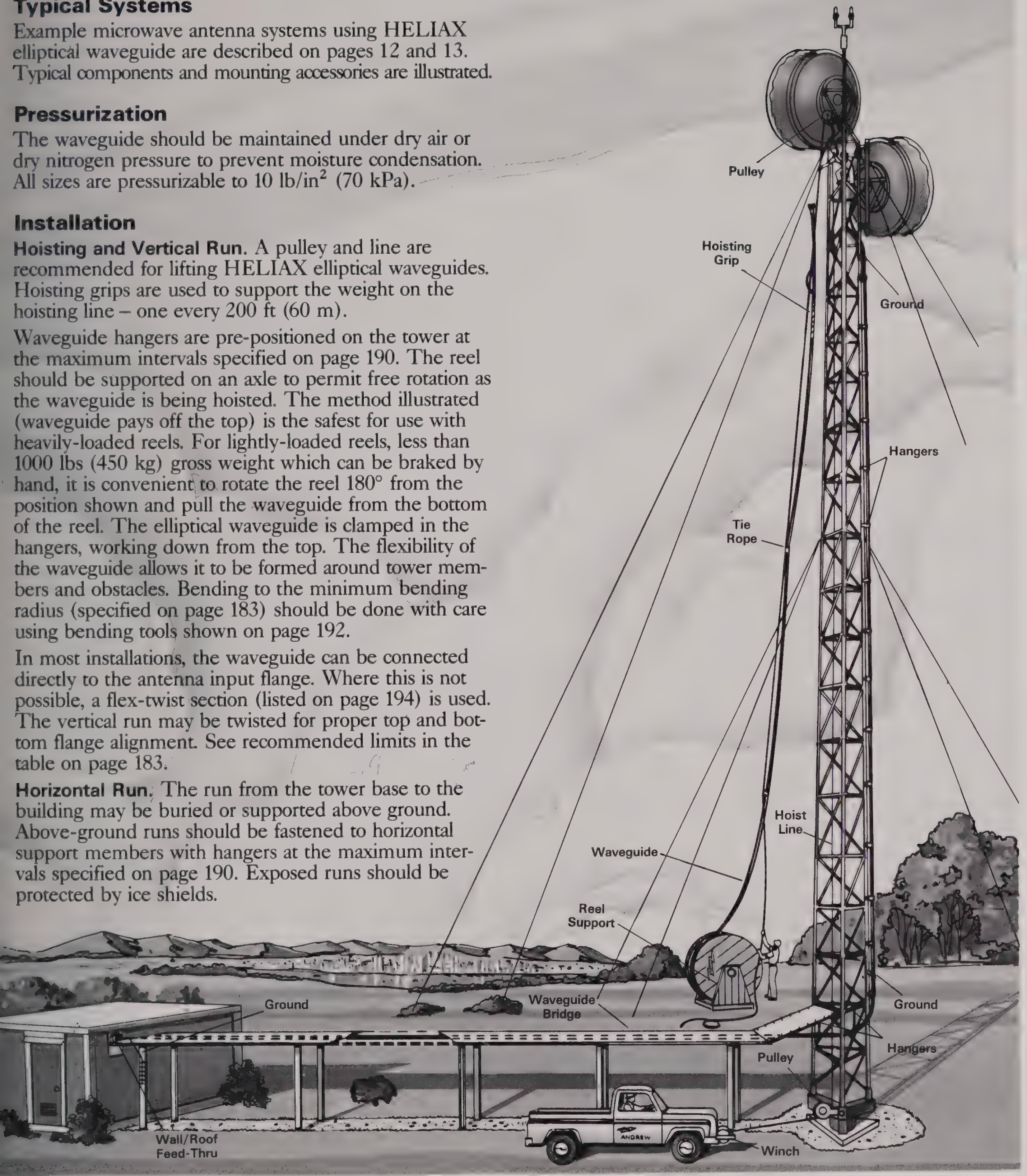
Installation

Hoisting and Vertical Run. A pulley and line are recommended for lifting HELIAX elliptical waveguides. Hoisting grips are used to support the weight on the hoisting line – one every 200 ft (60 m).

Waveguide hangers are pre-positioned on the tower at the maximum intervals specified on page 190. The reel should be supported on an axle to permit free rotation as the waveguide is being hoisted. The method illustrated (waveguide pays off the top) is the safest for use with heavily-loaded reels. For lightly-loaded reels, less than 1000 lbs (450 kg) gross weight which can be braked by hand, it is convenient to rotate the reel 180° from the position shown and pull the waveguide from the bottom of the reel. The elliptical waveguide is clamped in the hangers, working down from the top. The flexibility of the waveguide allows it to be formed around tower members and obstacles. Bending to the minimum bending radius (specified on page 183) should be done with care using bending tools shown on page 192.

In most installations, the waveguide can be connected directly to the antenna input flange. Where this is not possible, a flex-twist section (listed on page 194) is used. The vertical run may be twisted for proper top and bottom flange alignment. See recommended limits in the table on page 183.

Horizontal Run. The run from the tower base to the building may be buried or supported above ground. Above-ground runs should be fastened to horizontal support members with hangers at the maximum intervals specified on page 190. Exposed runs should be protected by ice shields.



Electrical Characteristics

Waveguide Type Numbers	Max. Waveguide Operating Range* GHz	$_eTE_{11}$ Mode Cutoff Freq. GHz	Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Group Velocity of Propagation, %	Average Power Rating, kW**
EW17, EWP17	1.7-2.4	1.364	1.7 2.0 2.3	0.46 (1.51) 0.36 (1.19) 0.33 (1.07)	60 73 81	35.4 45.0 49.8
EW20	1.9-2.7	1.566	2.5 2.6 2.7	0.44 (1.44) 0.43 (1.41) 0.42 (1.39)	78 80 81	33.4 34.2 34.8
EW28	2.6-3.5	2.153	2.9 3.1 3.5	0.68 (2.22) 0.62 (2.03) 0.56 (1.82)	67 72 79	16.5 18.1 20.1
EW34, EWP34	3.1-4.2	2.376	3.4 3.7 4.2	0.73 (2.39) 0.68 (2.23) 0.64 (2.09)	72 77 82	13.8 14.8 15.7
EW37, EWP37, EWP37S	3.3-4.3	2.750	3.7 3.95 4.2	0.92 (3.03) 0.84 (2.77) 0.79 (2.60)	67 72 76	9.77 10.7 11.4
EW44, EWP44	4.2-5.1	3.505	4.4 4.7 5.0	1.39 (4.54) 1.22 (4.00) 1.12 (3.69)	60 67 71	5.55 6.30 6.84
EWS44	4.2-5.1	3.505	4.4 4.7 5.0	1.71 (5.60) 1.49 (4.89) 1.36 (4.46)	60 67 71	4.44 5.10 5.58
EW52, EWP52, EWP52S	4.6-6.425	3.569	5.925 6.175 6.425	1.21 (3.96) 1.18 (3.87) 1.16 (3.80)	80 82 83	5.92 6.06 6.18
EW63, EWP63, EWP63S	5.85-7.125	3.959	6.425 6.775 7.125	1.40 (4.58) 1.35 (4.44) 1.32 (4.33)	79 81 83	4.74 4.89 5.01
EW64, EWP64	5.3-7.75	4.256	7.125 7.450 7.750	1.49 (4.89) 1.46 (4.78) 1.43 (4.69)	80 82 84	4.22 4.33 4.41
EW77, EWP77	6.1-8.5	4.722	7.125 7.750 8.500	1.91 (6.26) 1.79 (5.87) 1.70 (5.58)	75 79 83	3.12 3.33 3.51
EW85	7.7-9.8	6.412	8.5 9.15 9.8	3.45 (11.3) 3.12 (10.2) 2.93 (9.60)	66 71 76	1.46 1.62 1.72
EW90, EWP90, EWP90S	8.3-11.7	6.496	10.7 11.2 11.7	3.14 (10.31) 3.06 (10.05) 3.00 (9.84)	79 81 83	1.56 1.60 1.63
EW127A, EWP127A	10.0-13.25	7.524	11.7 12.7 13.25	3.74 (12.3) 3.55 (11.6) 3.47 (11.4)	77 81 82	1.20 1.26 1.29
EW132, EWP132	11.0-15.35	9.120	14.4 14.9 15.35	4.88 (16.0) 4.78 (15.7) 4.70 (15.4)	77 79 80	0.84 0.86 0.88
EW180, EWP180	14.0-19.7	11.15	17.7 18.7 19.7	6.13 (20.1) 5.91 (19.4) 5.75 (18.9)	78 80 82	0.54 0.56 0.57
EW220, EWP220	17.0-23.6	13.34	21.2 22.4 23.6	8.82 (28.9) 8.60 (28.2) 8.45 (27.7)	78 80 82	0.39 0.40 0.40

*Actual usable range may be limited by the connecting rectangular waveguide.

**Average power rating based on 42°C (76°F) temperature rise over 40°C (104°F) ambient and VSWR of 1.0.

Minimum Bending Radii and Maximum Twist

Waveguide Type Numbers	Minimum Bending Radii with Rebending, in (mm) E-Plane	H-Plane	Minimum Bending Radii without Rebending, in (mm) E-Plane	H-Plane	Maximum Twist, degrees per ft (m)
EW17, EWP17	28 (710)	81 (2060)	20 (510)	57 (1450)	0.25 (0.75)
EW20	26 (660)	71 (1800)	18 (460)	50 (1270)	0.25 (0.75)
EW28	22 (560)	52 (1320)	22 (560)	52 (1320)	0.25 (0.75)
EW34, EWP34	14 (360)	38 (972)	12 (300)	32 (810)	0.5 (1.5)
EW37, EWP37, EWP37S	17 (430)	41 (1040)	12 (300)	30 (760)	0.5 (1.5)
EW44, EWP44	15 (380)	32 (810)	11 (280)	22 (560)	0.5 (1.5)
EWS44	7 (180)	16 (400)	7 (180)	16 (410)	0.5 (1.5)
EW52, EWP52, EWP52S	12 (305)	32 (810)	8 (200)	22 (560)	1 (3)
EW63, EWP63, EWP63S	10 (260)	29 (740)	7 (180)	20 (510)	1 (3)
EW64, EWP64	10 (260)	27 (685)	10 (260)	27 (685)	1 (3)
EW77, EWP77	9 (230)	25 (635)	7 (180)	20 (510)	1 (3)
EW85	8 (200)	19 (480)	8 (200)	19 (480)	1 (3)
EW90, EWP90, EWP90S	7 (180)	19 (480)	6 (150)	13 (330)	2 (6)
EW127A, EWP127A	6 (150)	15 (380)	5 (130)	11 (280)	2 (6)
EW132, EWP132	5 (130)	14 (360)	5 (130)	14 (360)	2 (6)
EW180, EWP180	6 (150)	15 (380)	6 (150)	15 (380)	2 (6)
EW220, EWP220	4 (100)	9 (230)	4 (100)	9 (230)	2 (6)

Dimensions and Weights

Waveguide Type Numbers	Dimensions over Jacket Major and Minor in (mm)	Weight lb/ft (kg/m)
EW17, EWP17	5.65 x 2.99 (143.5 x 75.9)	2.73 (4.06)
EW20	5.02 x 2.83 (127.5 x 71.9)	1.85 (2.76)
EW28	3.65 x 2.33 (92.5 x 59.2)	1.37 (2.04)
EW34, EWP34	3.31 x 1.90 (84.1 x 48.3)	1.13 (1.68)
EW37, EWP37, EWP37S	2.90 x 1.86 (73.7 x 47.2)	0.84 (1.25)
EW44, EWP44	2.31 x 1.59 (58.7 x 40.4)	0.64 (0.96)
EWS44	2.31 x 1.59 (58.7 x 40.4)	0.70 (1.04)
EW52, EWP52, EWP52S	2.25 x 1.31 (57.2 x 33.3)	0.59 (0.88)
EW63, EWP63, EWP63S	2.01 x 1.16 (51.1 x 29.5)	0.51 (0.76)
EW64, EWP64	1.91 x 1.12 (48.5 x 28.4)	0.49 (0.73)
EW77, EWP77	1.72 x 1.00 (43.6 x 25.4)	0.45 (0.67)
EW85	1.32 x 0.90 (33.5 x 22.9)	0.33 (0.50)
EW90, EWP90, EWP90S	1.32 x 0.80 (33.5 x 20.3)	0.32 (0.48)
EW127A, EWP127A	1.11 x 0.67 (28.2 x 17.1)	0.29 (0.43)
EW132, EWP132	0.96 x 0.61 (24.4 x 15.5)	0.22 (0.33)
EW180, EWP180	0.79 x 0.49 (20.1 x 12.4)	0.15 (0.22)
EW220, EWP220	0.70 x 0.44 (17.8 x 11.2)	0.12 (0.18)

Elliptical Waveguide Connectors

Connectors are transitions from elliptical to rectangular cross sections and mate with industry standard rectangular waveguide flanges. Detailed information on flanges is presented on pages 208 and 209. Each connector includes a pressure inlet with a 1/8" female pipe thread, flange gasket, flange hardware and assembly instructions. All connectors are brass, except for the 117, 120 and 128 series, which are aluminum. Dimensions are listed below.

Connector Weights and Dimensions

Connector Type Numbers	Weight pounds (kg)	Dimensions, in (mm) Length (L)	Width (W)
117E, 117ET	7.0 (3.2)	15.9 (404)	6.9 (175)
117RT	5.0 (2.3)	8.9 (225)	4.6 (116)
120E	3.5 (1.6)	5.8 (147)	6.2 (157)
120R, 120R-3	4.8 (2.2)	9.0 (229)	4.4 (111)
128AE	7.3 (3.3)	12.7 (322)	5.0 (127)
134DE, 134DET	8.0 (3.6)	6.8 (174)	4.3 (109)
137DE, 137DET	6.0 (2.7)	6.4 (161)	4.6 (117)
144DC, 144DCT	5.4 (2.4)	5.8 (148)	4.0 (102)
144DE, 144DET	4.9 (2.2)	5.8 (148)	4.0 (102)
152DE, 152DET	4.2 (1.9)	5.6 (143)	3.7 (93)
252DC, 252DCT	4.1 (1.9)	5.8 (148)	3.7 (93)
252DE, 252DET	4.0 (1.8)	5.8 (148)	3.7 (93)
163DC, 163DCT	3.7 (1.7)	5.3 (135)	3.3 (84)
163DE, 163DET	3.5 (1.6)	5.3 (135)	3.3 (84)
164DC, 164DCT	3.5 (1.6)	5.3 (135)	3.3 (84)
164DE, 164DET	3.4 (1.5)	5.3 (135)	3.3 (84)
264DE, 264DET	3.4 (1.5)	5.2 (132)	3.3 (84)
177DC, 177DCT	2.8 (1.3)	4.8 (122)	2.8 (71)
177DE, 177DET	2.8 (1.3)	4.8 (122)	2.8 (71)
185AC	2.0 (0.9)	4.6 (118)	2.1 (52)
190DE, 190DET	1.9 (0.9)	4.4 (112)	2.3 (58)
290SC	1.9 (0.9)	3.6 (91)	2.3 (58)
1127DC, 1127DCT	1.8 (0.8)	3.6 (92)	2.2 (56)
1127DE, 1127DET	1.8 (0.8)	3.6 (92)	2.2 (56)
1132DC, 1132DCT	2.0 (0.9)	4.3 (109)	2.1 (52)
2132DC	1.5 (0.7)	3.8 (97)	2.1 (52)
1180DC, 1180DCT	0.9 (0.4)	3.3 (84)	1.5 (38)
1220ASC	0.7 (0.3)	2.3 (59)	1.73 (44)

D and S Series Connectors

D and S series connectors incorporate a corrugated split flare ring to accurately position the elliptical waveguide relative to the transition. When used with the new compact flaring tool kit, this allows low VSWR to be achieved without the need for field tuning.

Pressure Sealing

A precision molded silicone rubber gasket, which conforms to the shape of the waveguide corrugations, is used to provide a reusable pressure seal without the need for sealing compounds of any type.

Saw Guide

Each D series connector includes a disposable plastic saw guide to assure a square cut of the waveguide and the proper length for flaring.

Integral Flare Aid

D series connectors have a corrugated split flare ring, which functions as a flare aid. This innovation results in:

- ☐ Improved electrical performance through optimum positioning of the corrugation runout relative to the electrical axis of the waveguide.
- ☐ Firm support throughout the corrugation allowing high mating pressure at the point of electrical contact to eliminate intermodulation distortion.
- ☐ Fast, accurate field connector attachment.
- ☐ Field attachable with standard hand tools.

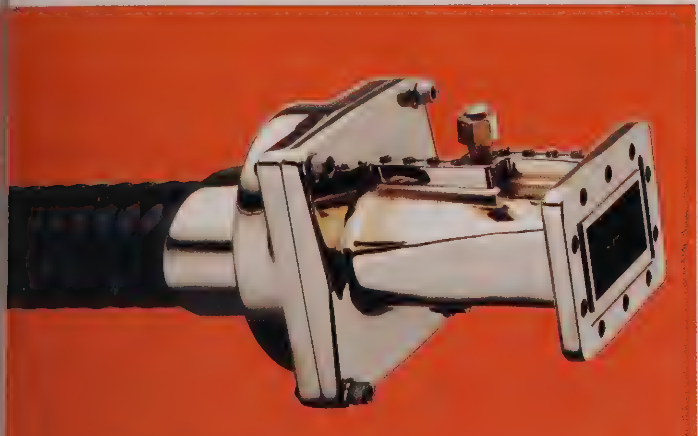
Compact Flaring Tool

New compact flaring tool* kits are now available exclusively from Andrew with none of the limitations normally associated with such devices. See page 190.

Tuning

Connectors are available in non-tunable, tunable (T-series), pre-tuned (P series) and fixed tuned** (S series) versions.

*Patented United States 4,590,785
**Patented United States 4,540,959



Super Premium Waveguide Assembly
Type EWP37S Waveguide and Type 137DET Connector

Type EWP37S Super Premium HELIAX Elliptical Waveguide

Super premium assemblies offer the lowest available VSWR. Assemblies consist of super premium waveguide with factory attached and tuned connectors.

Except for lower VSWR, HELIAX super premium elliptical waveguide has the same electrical and mechanical characteristics as the standard and premium versions.

Selection of super premium waveguide is by VSWR test after all manufacturing operations, including jacketing and marking, are completed. For this reason, standard, premium and super premium versions all carry the EW marking.

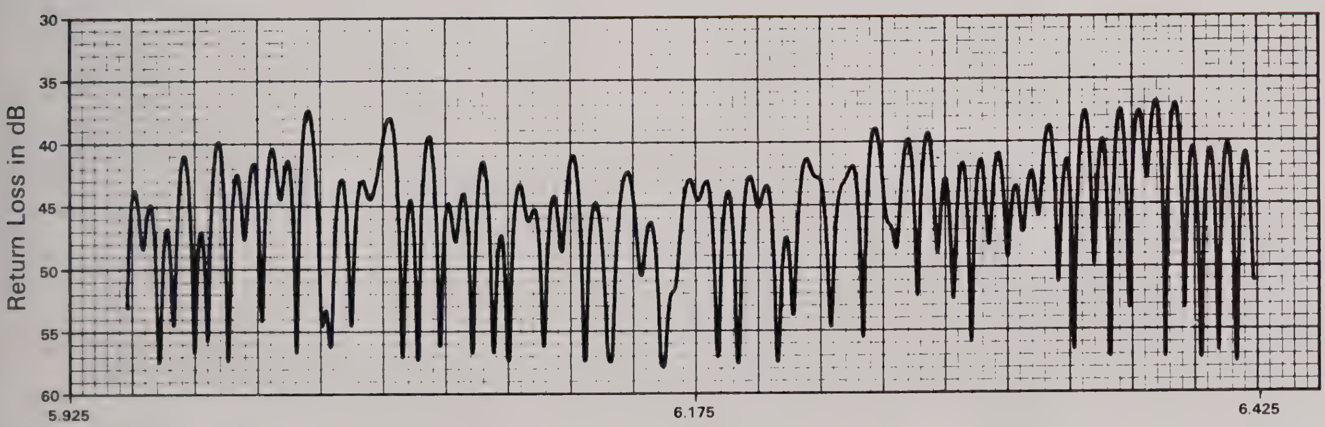
The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.

To Order. Specify *waveguide type number, frequency band in GHz, length in feet or metres* and "*fitted*" or "*unattached.*" Where fitted connectors on an assembly are different, specify which is "*first off*" the reel.

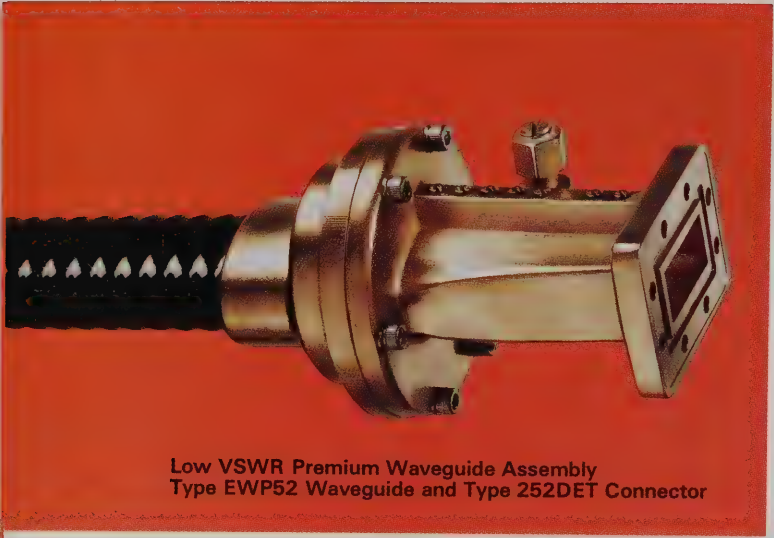
Ordering Information for Super Premium Waveguide Assemblies

Frequency Band, GHz	Super Premium Waveguide Type No.	Tunable Connector Type No.	Connector Mates with Flange Types U.S.	IEC	VSWR, max. (R.L., dB) up to 300 ft (90 m)
3.7-4.2	**EWP37S**	**137DET**	CPR229G	PDR40	1.06 (30.7)
5.925-6.425	**EWP52S**	**152DET**	CPR159G	PDR58	1.05 (32.3)*
		252DCT	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	1.05 (32.3)*
		252DET	CPR137G	PDR70	1.05 (32.3)*
6.425-7.125	**EWP63S**	**163DCT**	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	1.05 (32.3)
		163DET	CPR137G	PDR70	1.05 (32.3)
10.7-11.7	**EWP90S**	**190DET**	CPR90G	PDR100	1.05 (32.3)

*1.036 (35.0 dB) for lengths 150 ft (46 m) and shorter.



Sweep Measurement on Typical EWP52S Elliptical Waveguide Assembly Using Andrew Hybrid T Reflectometer



Low VSWR Premium Waveguide Assembly
Type EWP52 Waveguide and Type 252DET Connector

Low-VSWR, Premium Waveguide Assemblies

Premium assemblies consist of premium waveguide with factory attached and tuned connectors. Premium waveguide has very low VSWR characteristics. Selection of premium waveguide is by VSWR test after all manufacturing operations, including jacketing and marking, are completed. For this reason, standard, premium and super premium versions all carry the EW marking.

The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.

Pre-Tuned Connectors from Andrew are recommended for field-fitted applications requiring low VSWR without field tuning. Flaring tool kit, described on page 190, is required to achieve the indicated VSWR specification for pre-tuned connectors operating at 10 GHz and above. Pre-tuned connectors for other frequency bands are available on request.

To Order. Specify *waveguide type number, frequency band in GHz, length in feet or metres, connector type numbers,* and *"fitted"* or *"unattached".* Where fitted connectors on an assembly are different, specify which is *"first off"* the reel.

Ordering Information for Premium Waveguide Assemblies

Frequency† Band, GHz	Waveguide Type No.	Tunable Connector Type No.	Pre-Tuned Connector Type No.	Connector Mates with Flange Types U.S.	IEC	VSWR, max. (R.L., dB) up to 300 ft (90 m)
1.7–2.1	EWP17	117ET	—	CPR430G	PDR22	1.19 (21.2)
		117RT	—	7/8" EIA (with gas barrier)		1.23 (19.7)
		117RT-3	—	7/8" EIA (without gas barrier)		1.23 (19.7)
1.9–2.3	EWP17	117ET	—	CPR430G	PDR22	1.17 (22.1)
		117RT	—	7/8" EIA (with gas barrier)		1.27 (18.5)
		117RT-3	—	7/8" EIA (without gas barrier)		1.27 (18.5)
3.4–3.8	EWP34	134DET	—	CPR229G	PDR40	1.10 (26.4)
3.4–3.9	EWP34	134DET	—	CPR229G	PDR40	1.10 (26.4)
3.54–4.2	EWP34	134DET	134DEP-2	CPR229G	PDR40	1.08 (28.3)
3.6–4.2	EWP34	134DET	—	CPR229G	PDR40	1.08 (28.3)
3.7–4.2	EWP34	134DET	134DEP-1	CPR229G	PDR40	1.08 (28.3)
3.4–3.8	EWP37	137DET	—	CPR229G	PDR40	1.10 (26.4)
3.4–3.9	EWP37	137DET	—	CPR229G	PDR40	1.10 (26.4)
3.54–4.2	EWP37	137DET	137DEP-2	CPR229G	PDR40	1.08 (28.3)
3.6–4.2	EWP37	137DET	—	CPR229G	PDR40	1.08 (28.3)
3.7–4.2	EWP37	137DET	137DEP-1	CPR229G	PDR40	1.08 (28.3)
3.77–4.2	EWP37	137DET	—	CPR229G	PDR40	1.08 (28.3)
4.4–5.0	EWP44	144DCT	—	UG-148/U, UG-149/U	CAR48, UAR48, PAR48	1.07 (29.4)
		144DET	144DEP-1	CPR187G	PDR48	1.07 (29.4)
5.6–6.2	EWP52	152DET	—	CPR159G	PDR58	1.06 (30.7)
		252DCT	—	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	
		252DET	—	CPR137G	PDR70	
5.85–6.425	EWP52	152DET	—	CPR159G	PDR58	1.06 (30.7)
		252DCT	—	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	
		252DET	—	CPR137G	PDR70	
5.925–6.425	EWP52	152DET	152DEP-1	CPR159G	PDR58	1.06 (30.7)
		252DCT	—	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	
		252DET	252DEP-1	CPR137G	PDR70	

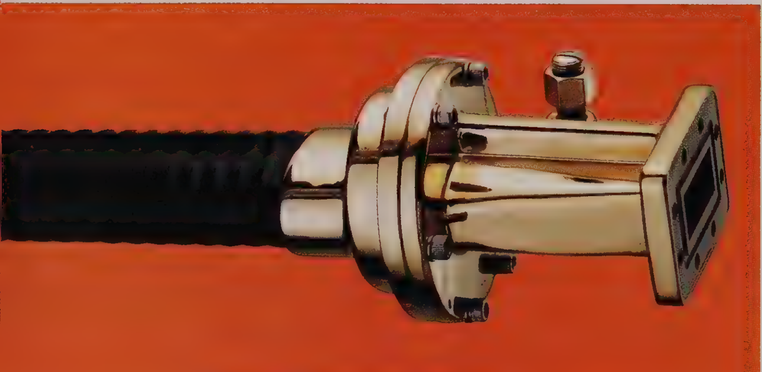
†Contact your local Andrew Sales office listed inside the back cover for information on other frequency bands.

Ordering Information for Premium Waveguide Assemblies

Frequency‡ Band, GHz	Waveguide Type No.	Tunable Connector Type No.	Pre-Tuned Connector Type No.	Connector Mates with Flange Types U.S.	IEC	VSWR, max. (R.L., dB) up to 300 ft (90 m)
6.525-6.875	EWP63	163DCT 163DET	163DCP-1 —	UG-343B/U, UG-344/U CPR137G	CAR70, UAR70, PAR70 PDR70	1.05 (32.3)
6.425-7.125	EWP63	163DCT 163DET	163DCP-2 163DEP-2	UG-343B/U, UG-344/U CPR137G	CAR70, UAR70, PAR70 PDR70	1.06 (30.7)
7.125-7.750	EWP64	164DCT 164DET 264DET	164DCP-1 164DEP-1 264DEP-1	UG-343B/U, UG-344/U CPR137G CPR112G	CAR70, UAR70, PAR70 PDR70 PDR84	1.06 (30.7)
7.125-7.750	EWP77	177DCT 177DET	177DCP-1 177DEP-1	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.06 (30.7)
7.725-8.275	EWP77	177DCT 177DET	— —	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.06 (30.7)
7.725-8.500	EWP77	177DCT 177DET	— —	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.06 (30.7)
7.750-8.500	EWP77	177DCT 177DET	177DCP-2 177DEP-2	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.06 (30.7) 1.06 (30.7)
10.5-10.7 10.7-11.7	EWP90 EWP90	190DET 190DET	190DEP-2† 190DEP-1† 290SC*†	CPR90G CPR90G WR75 choke or cover	PDR100 PDR100 CBR120, UBR120, PBR120	1.06 (30.7) 1.06 (30.7) 1.06 (30.7)
11.7-12.2	EWP127A	1127DCT	—	WR75 choke or cover	CBR120, UBR120, PBR120	1.08 (28.3)
		1127DET	—	—	PDR120	1.08 (28.3)
		1127DKT	—	Pressurizable Contact Flange		1.08 (28.3)
12.2-12.7	EWP127A	1127DCT	—	WR75 choke or cover	CBR120, UBR120, PBR120	1.08 (28.3)
		1127DET	—	—	PDR120	1.08 (28.3)
12.7-13.25	EWP127A	1127DCT	1127DCP-3†	WR75 choke or cover	CBR120, UBR120, PBR120	1.08 (28.3)
		1127DET	1127DEP-3†	—	PDR120	1.08 (28.3)
14.0-14.5	EWP132	2132DCT	2132DCP-1†	WR75 choke or cover	CBR120, UBR120, PBR120	1.08 (28.3)
		2132DKT	—	Pressurizable Contact Flange		1.08 (28.3)
14.0-14.5	EWP132	2132DET	2132DEP-1†	—	PDR120	1.08 (28.3)
14.4-15.35	EWP132	1132DCT	—	UG-419/U, UG-541/U	CBR140, UBR140, PBR140	1.08 (28.3)
		1132DET	1132DEP-1†	—	PDR140	1.08 (28.3)
17.7-19.7	EWP180	1180DCT	1180DCP-1†	UG-595/U, UG-596A/U	CBR220, UBR220, PBR220	1.09 (27.3)
21.2-23.6	EWP220		1220ASC*†	UG-595/U, UG-596A/U	CBR220, UBR220, PBR220	1.10 (26.4)

*Fixed tuned connector.
†Flaring tool kit (see page 190) required to achieve indicated VSWR specification for field assemblies.

‡Contact your local Andrew Sales Office listed inside the back cover for information on other frequency bands.



Standard Waveguide Assembly
Type EW63 Waveguide and 163DE Connector

Standard Waveguide Assemblies

Standard Assemblies consist of standard waveguide and factory attached non-tunable connectors.

The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.

To Order. Specify *waveguide type number, frequency band in GHz, length in feet or metres, connector type numbers,* and *"fitted"* or *"unattached".* Where fitted connectors on an assembly are different, specify which is *"first off"* the reel.

Ordering Information for Standard Waveguide Assemblies

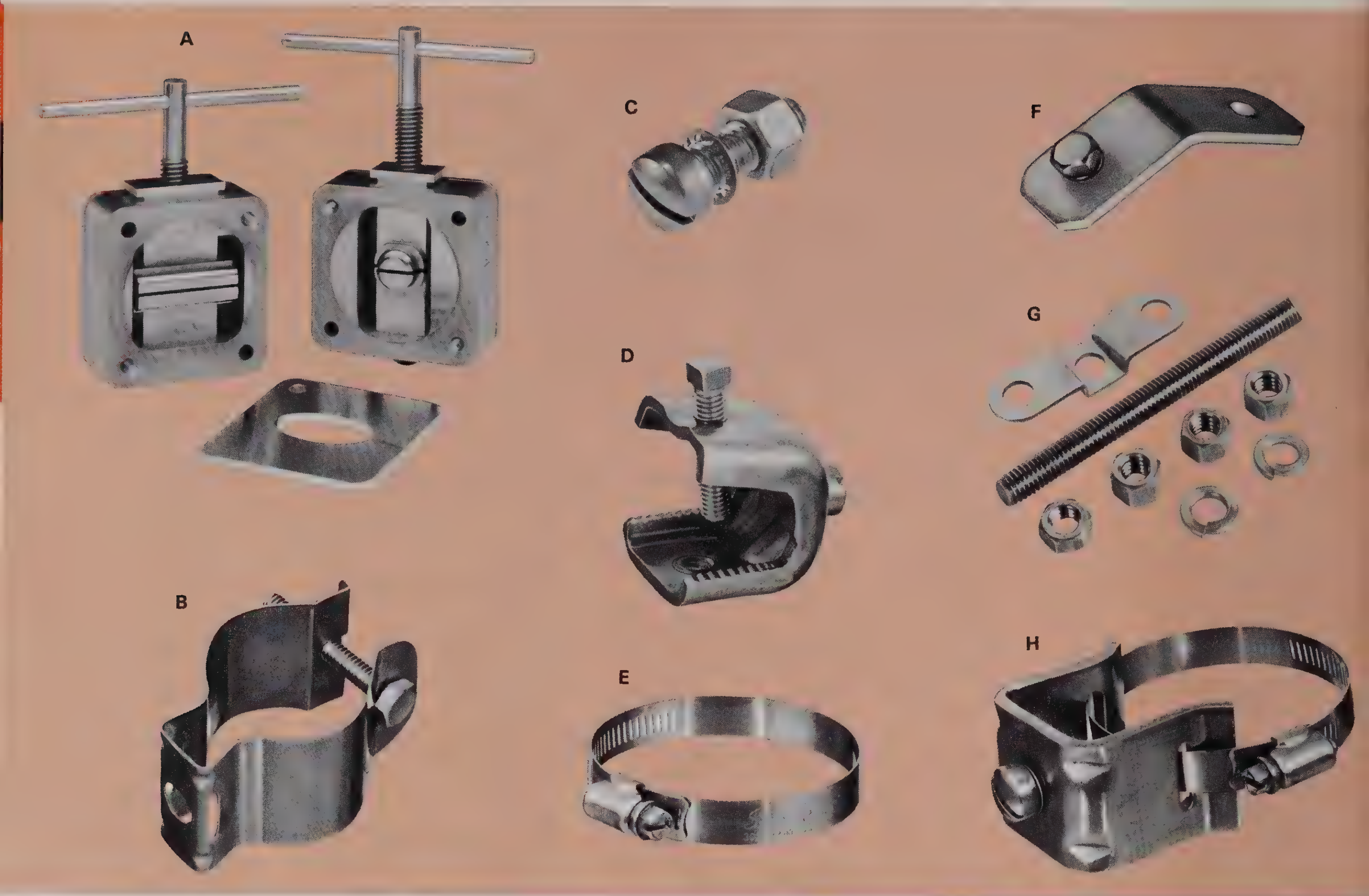
Frequency† Band, GHz	Waveguide Type No.	Connector Type No.	Connector Mates with Flange Types U.S.	IEC	VSWR, Max. (R.L. dB) up to 300 ft (90 m)
1.7 – 2.1	EW17	117E	CPR430G	PDR22	1.25 (19.1)
1.9 – 2.3	EW17	117E	CPR430G	PDR22	1.25 (19.1)
2.5 – 2.7	EW20	120E	CPR340G	PDR26	1.15 (23.1)
		120R	7/8" EIA (with gas barrier)		1.15 (23.1)
		120R-3	7/8" EIA (without gas barrier)		1.15 (23.1)
2.9 – 3.1	EW28	128AE	CPR284G	PDR32	1.20 (20.8)
3.1 – 3.5	EW28	128AE	CPR284G	PDR32	1.15 (23.1)
3.1 – 3.6	EW34	134DE	CPR229G	PDR40	1.20 (20.8)
3.4 – 3.9	EW34	134DE	CPR229G	PDR40	1.15 (23.1)
3.54 – 4.2	EW34	134DE	CPR229G	PDR40	1.15 (23.1)
3.6 – 4.2	EW34	134DE	CPR229G	PDR40	1.15 (23.1)
3.7 – 4.2	EW34	134DE	CPR229G	PDR40	1.15 (23.1)
3.4 – 3.9	EW37	137DE	CPR229G	PDR40	1.15 (23.1)
3.54 – 4.2	EW37	137DE	CPR229G	PDR40	1.15 (23.1)
3.6 – 4.2	EW37	137DE	CPR229G	PDR40	1.15 (23.1)
3.7 – 4.2	EW37	137DE	CPR229G	PDR40	1.15 (23.1)
4.4 – 5.0	EW44	144DC	UG-148/U, UG-149/U	CAR48, UAR48, PAR48	1.15 (23.1)
		144DE	CPR187G	PDR48	
4.4 – 5.0	EWS44 (Superflexible)	144DC-3	UG-148/U, UG-149/U	CAR48, UAR48, PAR48	1.15 (23.1)
		144DE-3	CPR187G	PDR48	1.15 (23.1)
5.6 – 6.2	EW52	152DE	CPR159G	PDR58	1.15 (23.1)
		252DC	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	
		252DE	CPR137G	PDR70	
5.925 – 6.425	EW52	152DE	CPR159G	PDR58	1.15 (23.1)
		252DC	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	
		252DE	CPR137G	PDR70	

†Contact your local Andrew Sales office listed inside the back cover for information on other frequency bands.

Ordering Information for Standard Waveguide Assemblies

Frequency† Band, GHz	Waveguide Type No.	Connector Type No.	Connector Mates with Flange Types U.S.	IEC	VSWR, Max. (R.L. dB) up to 300 ft (90 m)
6.525 – 6.875	EW63	163DC 163DE	UG-343B/U, UG-344/U CPR137G	CAR70, UAR70, PAR70 PDR70	1.15 (23.1)
6.425 – 7.125	EW63	163DC 163DE	UG-343B/U, UG-344/U CPR137G	CAR70, UAR70, PAR70 PDR70	1.15 (23.1)
7.125 – 7.750	EW64	164DC 164DE 264DE	UG343B/U, UG-344/U CPR137G CPR112G	CAR70, UAR70, PAR70 PDR70 PDR84	1.15 (23.1)
7.125 – 7.750	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
7.125 – 7.850	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
7.425 – 7.725	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
7.425 – 7.900	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
7.725 – 8.500	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
7.750 – 8.500	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
8.2 – 8.5	EW77	177DC 177DE	UG-52B/U, UG-51/U CPR112G	CBR84, UBR84, PBR84 PDR84	1.15 (23.1)
8.5 – 9.8	EW85	185AC	UG-40B/U, UG-39/U	CBR100, UBR100, PBR100	1.17 (22.1)
10.5 – 10.7	EW90	190DE 290SC	CPR90G WR75 choke or cover	PDR100 CBR120, UBR120, PBR120	1.15 (23.1) 1.15 (23.1)
10.7 – 11.7	EW90	190DE 290SC	CPR90G WR75 choke or cover	PDR100 CBR120, UBR120, PBR120	1.15 (23.1) 1.15 (23.1)
11.7 – 12.2	EW127A	1127DC 1127DE 1127DK	WR75 choke or cover — Pressurizable Contact Flange	CBR120, UBR120, PBR120 PDR120	1.15 (23.1) 1.15 (23.1) 1.15 (23.1)
11.7 – 12.7	EW127A	1127DC 1127DE	WR75 choke or cover –	CBR120, UBR120, PBR120 PDR120	1.15 (23.1) 1.15 (23.1)
12.2 – 12.7	EW127A	1127DC 1127DE	WR75 choke or cover –	CBR120, UBR120, PBR120 PDR120	1.15 (23.1) 1.15 (23.1)
12.7 – 13.25	EW127A	1127DC 1127DE	WR75 choke or cover –	CBR120, UBR120, PBR120 PDR120	1.15 (23.1) 1.15 (23.1)
14.0 – 14.5	EW132	2132DC 2132DE 2132DK	WR75 choke or cover – Pressurizable Contact Flange	CBR120, UBR120, PBR120 PDR120	1.15 (23.1) 1.15 (23.1) 1.15 (23.1)
14.4 – 15.35	EW132	1132DC 1132DE	UG-419/U, UG-541/U –	CBR140, UBR140, PBR140 PDR140	1.15 (23.1) 1.15 (23.1)
17.7 – 19.7	EW180	1180DC	UG-596A/U, UG-595/U	CBR220, UBR220, PBR220	1.15 (23.1)
21.2 – 22.0	EW220	1220ASC	UG-595/U, UG-596A/U	CBR220, UBR220, PBR220	1.15 (23.1)
22.0 – 23.6	EW220	1220ASC	UG-595/U, UG-596A/U	CBR220, UBR220, PBR220	1.15 (23.1)

† Contact your local Andrew Sales Office listed inside the back cover for information on other frequency bands.



A Flaring Tool Kit. Major and minor axis flaring tools * produce consistent, high accuracy waveguide flares having a uniform contact area for optimum electrical performance. Compact design is easy to use in crowded areas above radio bays and can easily be carried to top of tower when required. Includes carrying case and instructions. Especially recommended for field installation of pre-tuned connectors on premium waveguide. For further information, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1370.

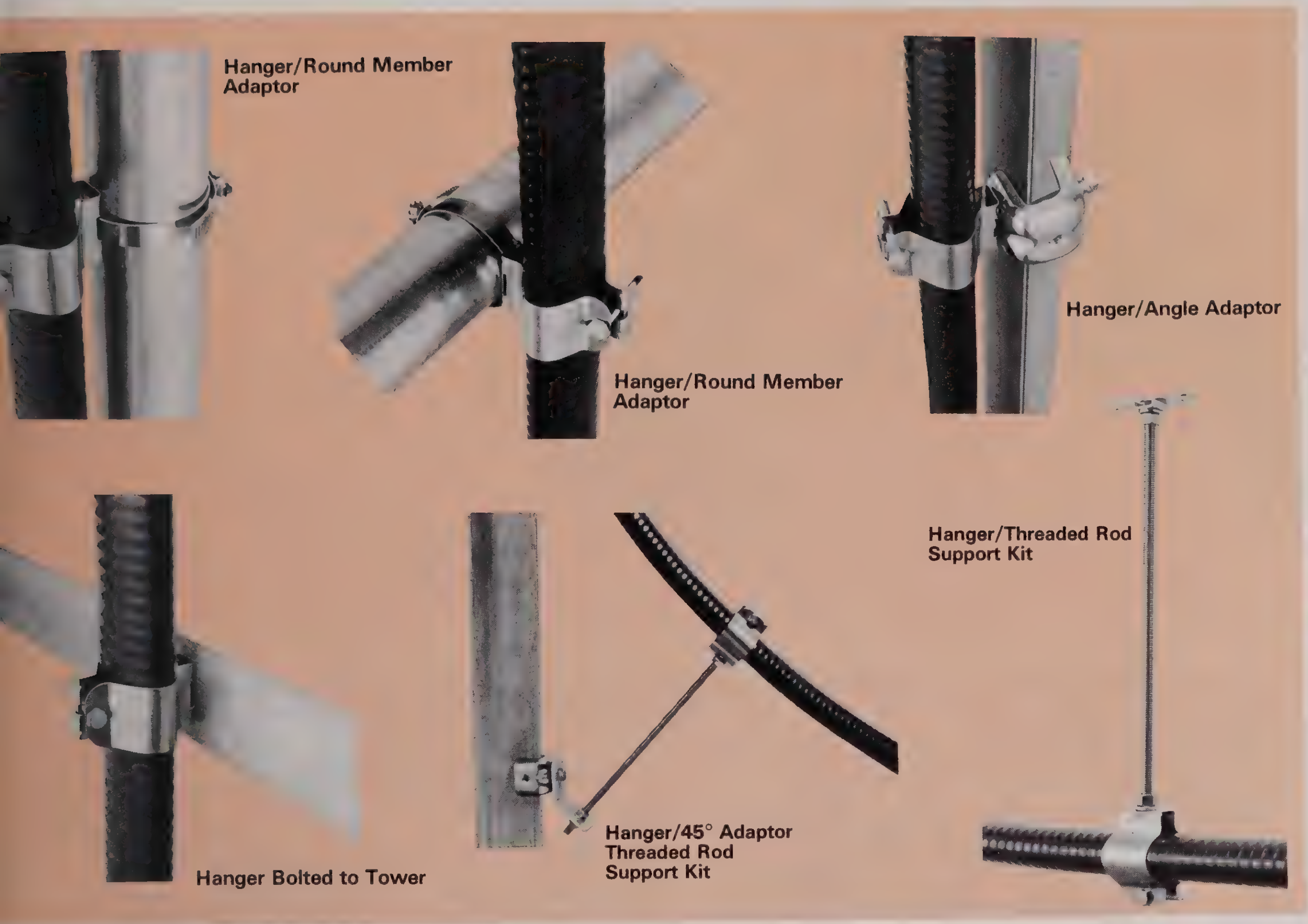
For Waveguide Types	Type Number
EW37, EWP37, EWP37S	**205869**
EW44, EWP44	**206135**
EWS44	**206135-2**
EW52, EWP52, EWP52S	**204897**
EW63, EWP63, EWP63S	**204677**
EW64, EWP64	**202358**
EW77, EWP77	**202421**
EW90, EWP90, EWP90S	**204919**
EW127A, EWP127A	**204960**
EW132, EWP132	**203809**
EW180, EWP180	**201439**
EW220, EWP220	**205127**

*Patented United States 4,590,785

B Waveguide Hanger Kit of 10 stainless steel hangers. Mount with 3/8 inch hardware or adaptors.

For Waveguide Type Numbers	Waveguide Hanger Kit	Maximum Hanger Spacing ft (m)
EW17, EWP17	**31766-9**	5 (1.5)
EW20	**31766-10**	5 (1.5)
EW28	**31766-11**	5 (1.5)
EW34, EWP34	**42396A-15**	5 (1.5)
EW37, EWP37, EWP37S	**42396A-4**	4 (1.2)
EW44, EWS44, EWP44	**42396A-2**	4 (1.2)
EW52, EWP52, EWP52S	**42396A-8**	4 (1.2)
EW63, EWP63, EWP63S	**42396A-7**	4 (1.2)
EW64, EWP64	**42396A-1**	4 (1.2)
EW77, EWP77	**42396A-11**	4 (1.2)
EW85	**42396A-5**	4 (1.2)
EW90, EWP90, EWP90S	**42396A-5**	4 (1.2)
EW127A, EWP127A	**42396A-9**	4 (1.2)
EW132, EWP132	**31766-13**	4 (1.2)
EW180, EWP180	**43211**	20 in (510 mm)
EW220, EWP220	**43211**	20 in (510 mm)

C Hardware Kit of 10 stainless steel fillister-head bolts, 3/8 inch lockwashers, and nuts for attachment of hangers to drilled tower members.
3/4 in (19 mm) long .... Type **31769-5**
1 in (25 mm) long .... Type **31769-1**



D Angle Adaptor Kit of 10 stainless steel clamps to mount waveguide hangers to angle members up to 7/8 in (22 mm) thick .... Type **31768A**

E Round Member Adaptor Kit of 10 stainless steel clamps to mount hangers to round support members. Two kits are required for use with each EW17 and EW20 hanger kit. One kit is required for all other sizes.

Member Diameter, in (mm)	Type No.
1 – 2 (25 – 50)	**31670-1**
2 – 3 (50 – 75)	**31670-2**
3 – 4 (75 – 100)	**31670-3**
4 – 5 (100 – 125)	**31670-4**
5 – 6 (125 – 150)	**31670-5**

F 45° Adaptor Kit of 10. Use with angle adaptor and threaded rod support kit to place a hanger at a waveguide bend. Galvanized steel .... Type **42334**

G Threaded Rod Support Kit. Stainless steel. Use to mount hangers away from supporting structure, under waveguide bridge, inside equipment room and to restrain waveguide bends. Includes 3/8 inch diameter threaded rod, nuts and washers. Attach to ceiling using included ceiling mounting bracket. Attach to angle tower members with 31768A angle adaptors. Attach to round tower members with 30848 series tower standoffs.

	Kit of 1	Kit of 5
12 inch (305 mm) rod	**31771**	**31771-4**
24 inch (610 mm) rod	**31771-9**	**31771-6**

H Tower Standoff Kit of 10 adaptors with round member clamps and 3/8 inch hardware. Provides clearance for tower leg flanges.

Member Diameter in (mm)	1 in (25mm) Standoff	2.5 in (60mm) Standoff
0.75 – 1.5 (20 – 40)	**30848-5**	—
1.5 – 3.0 (40 – 75)	**30848-4**	—
3 – 4 (75 – 100)	**30848-1**	**41108A-1**
4 – 5 (100 – 125)	**30848-2**	**41108A-2**
5 – 6 (125 – 150)	**30848-3**	**41108A-3**

A Grounding Kit used to ground waveguide to tower.

B Splice.

C Hoisting Grip used at 200 ft (60 m) intervals to raise waveguide on tower.

D Bending Tool Kit for elliptical waveguide installation. One each E- and H-plane form included.

E Connector Reattachment Kit includes rubber gasket parts (except flange gaskets) which may need replacing during removal and subsequent reattachment of connectors.

F Single Entrance Wall/Roof Feed-Thru Assembly. Includes rubber boot, clamp, and galvanized steel plate. Order from table at right.

G Waveguide Boot for use with multiple entrance wall/roof feed-thru plate (Item H). Boot diameter of 4 in or 5 in (102 or 127 mm) is available to match plate. Order individually from table at right.

H Multiple Entrance Wall/Roof Feed-Thru Plate. (Aluminum) Use with waveguide boots (Item G). Order from table at right.

Accessories

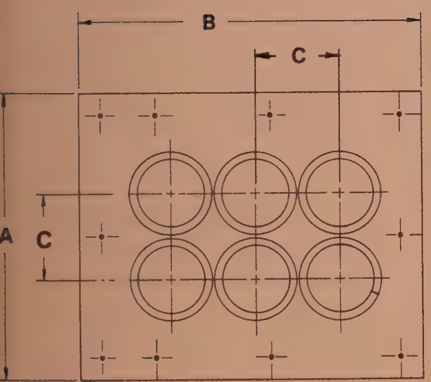
For Waveguide Type Numbers	Grounding Kit	Splice Connector	Hoisting Grip	Bending Tool Kit	Connector Reattachment Kit
EW17, EWP17	204989-6	117Z	34759	33586-4	33544-10
EW20	204989-6	120Z	34759	33586-4	33544-11
EW28	204989-5	128AZ	26985A	33586-5	—
EW34, EWP34	204989-5	134DZ	26985A	33586-11	33544-43
EW37, EWP37, EWP37S	204989-5	137DZ	31535	33586-3	33544-24
EW44, EWS44, EWP44	204989-4	144DZ	24312A	33586-3	33544-32
EW52, EWP52, EWP52S	204989-4	152DZ	24312A	33586-7	33544-38
EW63, EWP63, EWP63S	204989-4	163DZ	24312A	33586-8	33544-33
EW64, EWP64	204989-3	164DZ	29961	33586-2	33544-35
EW77, EWP77	204989-3	177DZ	19256B	33586-9	33544-34
EW85	204989-2	185AZ	29958	33586-1	33544-17
EW90, EWP90, EWP90S	204989-2	190DZ	29958	33586-1	33544-37
EW127A, EWP127A	204989-2	1127DZ	29958	33586-1	33544-41
EW132, EWP132	204989-2	1132DZ	29958	33586-1	33544-39
EW180, EWP180	204989-1	1180DZ	43094	33586-1	33544-42
EW220, EWP220	204989-1	1220DZ	43094	33586-1	33544-44

E

F

G

H

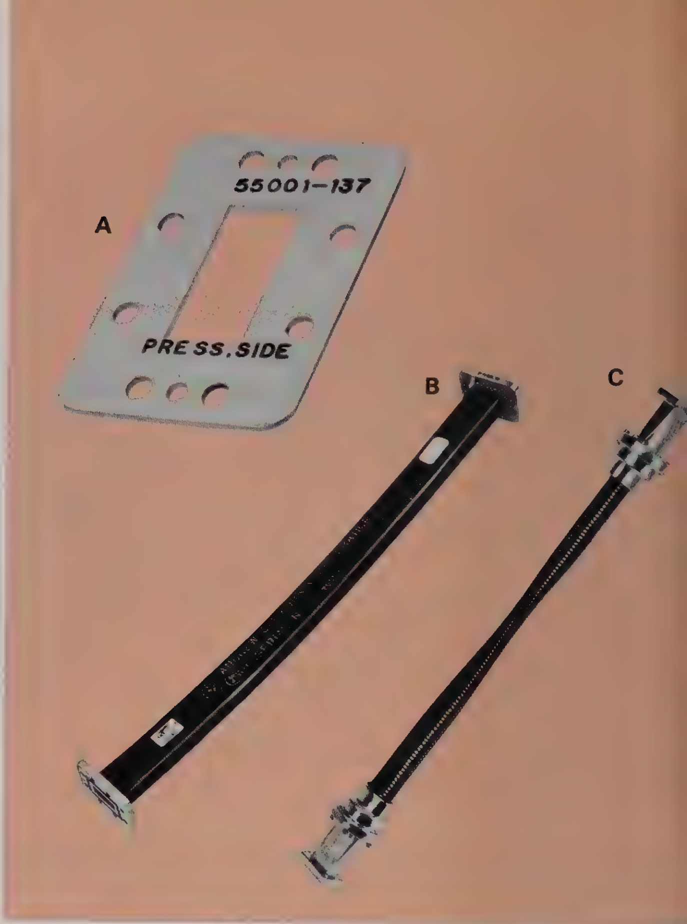


Wall/Roof Feed-Thru Assemblies and Waveguide Boots

For Waveguide Type Numbers	Single Entrance Wall/Roof Feed-Thru Assembly	Waveguide Boots (For Plates Below) 4 in (102 mm) Diameter	5 in (127 mm) Diameter
EW17, EWP17	35849-10	—	—
EW20	35849-9	—	—
EW28	35849-13	—	—
EW34, EWP34	35849-17	204679-34	48939-34
EW37, EWP37, EWP37S	35849-8	204679-37	48939-37
EW44, EWS44, EWP44	35849-7	204679-44	48939-44
EW52, EWP52, EWP52S	35849-14	204679-52	48939-52
EW63, EWP63, EWP63S	35849-6	204679-63	48939-63
EW64, EWP64	35849-12	204679-64	48939-64
EW77, EWP77	35849-16	204679-77	48939-77
EW85	35849-3	—	—
EW90, EWP90, EWP90S	35849-15	204679-90	48939-90
EW127A, EWP127A	35849-1	204679-127	48939-122
EW132, EWP132	35849-11	204679-132	48939-132
EW180, EWP180	35849-18	204679-180	48939-180
EW220, EWP220	35849-19	204679-220	48939-220

Multiple Entrance Wall/Roof Feed-Thru Plate

Number of Openings	Dimen. A in (mm)	Dimen. B in (mm)	Dimen. C in (mm)	Type
4 in (102 mm) Diameter Entry Opening				
1	7 (178)	7 (178)	—	204673-1
1	5 (127)	5 (127)	—	204673-2
4	9 (229)	25.5 (648)	5.12 (130)	204673-4
8	17.5 (444)	25.5 (648)	5.12 (130)	204673-8
5 in (127 mm) Diameter Entry Opening				
1	9.5 (241)	9.5 (241)	—	48940-1
2	9.5 (241)	17.5 (444)	7 (178)	48940-2
3	9.5 (241)	25.5 (648)	7 (178)	48940-3
4	17.5 (444)	17.5 (444)	7 (178)	48940-4
6	17.5 (444)	25.5 (648)	7 (178)	48940-6



A Pressure Window. Maximum pressure 10 lb/in^2 (70 kPa). 55001 series (CPR) includes half-thickness gasket.

B Flex-Twist Section. Silver plated brass with pressure-tight neoprene protective jacket. Includes set of hardware and gasket. Length is 2 ft (0.6 m). See pages 203-205 for other lengths and high power versions.

Flange Gasket (not illustrated). Spare full and half-thickness gaskets.

C Elliptical Waveguide Twist. HELIAX elliptical waveguide with a built-in 90° twist to match planes between the top circular waveguide transition and the antenna. Elliptical waveguide twists minimize intermodulation distortion sometimes associated with flex-twist sections, and can be trimmed for assembly lengths from 3 to 14 ft (1 – 4.2 m). Tunable connectors are included for attachment in the field. Support with hangers every 2 ft (0.6 m). Ten hangers are included. Order grounding kits separately.

Pressure Windows, Flex-Twist Sections and Flange Gaskets

Flange Types	Pressure Windows Type Number	Pressure Windows VSWR, Max.* (R.L., dB)	2 ft (0.6 m) Flex-Twist Sections Type Number	2 ft (0.6 m) Flex-Twist Sections VSWR, Max.* (R.L., dB)	Flange Gasket Type No. Full Gasket	Flange Gasket Type No. Half Gasket
CPR340G	**55001-340**	1.02 (40.1)	—	—	**32457-2**	**55072-340**
CPR284G	**55001-284**	1.02 (40.1)	—	—	**40611**	**55072-284**
CPR229G	**55001-229**	1.01 (46.1)	**55421-24**	1.03 (36.6)	**31619**	**55072-229**
UG-148/U, UG-149/U	**55000-187**	1.04 (34.2)	**52095-24**	1.10 (26.4)	**10683-307**	—
CPR187G	**55001-187**	1.01 (46.1)	**55419-24**	1.03 (36.6)	**55688**	**55072-187**
CPR159G	**55001-159**	1.01 (46.1)	**55417-24**	1.03 (36.6)	**54769**	**55072-159**
UG-343B/U, UG-344/U	**55000-137**	1.04 (34.2)	**19075-24**	1.10 (26.4)	**10683-304**	—
CPR137G	**55001-137**	1.01 (46.1)	**55415-24**	1.03 (36.6)	**28030**	**55072-137**
UG-52B/U, UG-51/U	**55000-112**	1.04 (34.2)	**51727-24**	1.10 (26.4)	**10683-305**	—
CPR112G	**55001-112**	1.01 (46.1)	**55413-24**	1.03 (36.6)	**32349**	**55072-112**
UG-40B/U, UG-39/U	**55000-90**	1.04 (34.2)	**51737-24**	1.10 (26.4)	**10683-329**	—
CPR90G	**55001-90**	1.01 (46.1)	**55411-24**	1.03 (36.6)	**31861**	**55072-90**
WR75 Choke/Cover	**55000-75**	1.04 (34.2)	**51747-24**	1.10 (26.4)	**10683-312**	—
UG-419/U, UG-541/U	**55000-62**	1.04 (34.2)	**53215-24**	1.10 (26.4)	**10683-319**	—
UG-596A/U, UG-595/U	**55000-42**	1.04 (34.2)	**163619-24**	1.25 (19.1)	**10683-328**	—

*Operating Bands are listed on page 202.

HELIAX Elliptical Waveguide Twist Assemblies

Frequency Band, GHz	Type No.	Connectors Mate With U.S.	Connectors Mate With IEC	Grounding Kit Type No.	Minimum Bending Radii, in (mm) E-Plane	Minimum Bending Radii, in (mm) H-Plane	Mid-Band Attenuation dB/ft (m)	VSWR, Typ. (R.L., dB)
5.925 – 6.425	**44730-1**	CPR137G	PDR70	**204989-3**	9 (230)	22 (560)	0.019 (0.063)	1.06 (30.7)
6.425 – 7.125	**44730-1**	CPR137G	PDR70	**204989-3**	9 (230)	22 (560)	0.017 (0.056)	1.06 (30.7)
7.725 – 8.5	**44978-1**	CPR112G	PDR84	**204989-3**	9 (230)	22 (560)	0.025 (0.082)	1.06 (30.7)
10.7 – 11.7	**45029**	CPR90G	PDR100	**204989-2**	7 (180)	19 (480)	0.030 (0.098)	1.06 (30.7)
12.7 – 13.25	**44910-1**	WR75 choke or cover		**204989-2**	6 (150)	15 (380)	0.040 (0.131)	1.06 (30.7)

Factory return loss measurement of fitted HELIAX® elliptical waveguide assembly

The Andrew hybrid T reflectometer is a unique and highly directive test component useful for measuring return loss or VSWR in waveguide systems. The reflectometer utilizes a precision hybrid T junction to separate the incident and reflected waves at the input of the system under test.

In addition to the reflectometer, a signal generator and equipment to detect and display the return loss or VSWR are necessary. For information on operation of the Andrew hybrid T reflectometer, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 37260.

To Order specify Type Number from the table. A calibration load, a termination load and a carrying case are included.

Elliptical Waveguide Sliding Load. Spear type termination load used at far end of bulk reels to terminate waveguide without attaching a connector and calibration load.

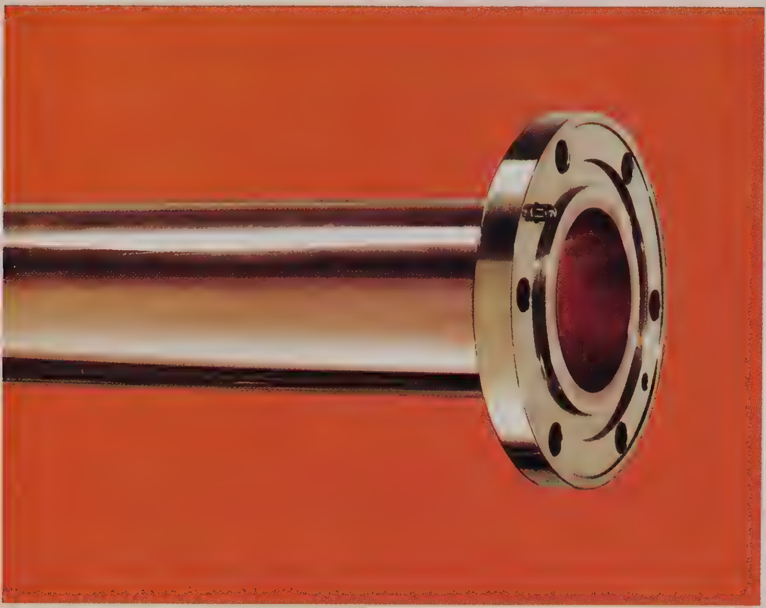
Elliptical Waveguide Sliding Loads

Waveguide Type	Type No.	Frequency Band, GHz	VSWR, Max. (R.L., dB)
EW37	**40502-37**	3.4–4.2	1.052 (32)
EW44	**40502-44**	4.4–5.0	1.02 (40)
EW52	**40502-52**	5.925–6.425	1.02 (40)
EW63	**40502-63**	6.425–7.125	1.02 (40)
EW90	**40502-90**	10.5–11.7	1.02 (40)

Ordering Information — Hybrid T Reflectometers

Frequency Band GHz	Waveguide Size EIA	IEC	Type Number	Directivity Min., dB	Mates with Flange Types EIA*	U.S. Mil	IEC
1.7–2.110	WR430	R22	**49000-430A-1**	50	CPR430G	—	PDR22
1.9–2.3	WR430	R22	**49000-430B-1**	50	CPR430G	—	PDR22
2.45–2.75	WR340	R26	**49000-340C-1**	60	CPR340G	—	PDR26
2.9–3.5	WR284	R32	**49000-284D-1**	60	CPR284G	—	PDR32
3.4–4.2	WR229	R40	**49000-229E-1**	55	CPR229G	—	PDR40
3.7–4.2	WR229	R40	**49000-229F-1**	60	CPR229G	—	PDR40
4.4–5.0	WR187	R48	**49000-187G-1**	60	CPR187G	UG-148C/U UG-149A/U	CAR48, UAR48 PAR48, PDR48
5.925–6.425	WR159	R58	**49000-159H-1**	60	CPR159G	—	PDR58
5.925–6.425	WR137	R70	**49000-137H-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
5.925–7.125	WR137	R70	**49000-137J-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
5.925–7.750	WR137	R70	**49000-137K-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
7.125–8.5	WR112	R84	**49000-112L-1**	60	CPR112G	UG-52B/U UG-51/U	CBR84, UBR84 PBR84, PDR84
10.5–11.7	WR90	R100	**49000-90M-1**	60	CPR90G	UG-40B/U UG-39/U	CBR100, UBR100 PBR100, PDR100
12.2–13.25	WR75	R120	**49000-75N-1**	60	—	WR75 choke and cover	CBR120, UBR120 PBR120
12.2–13.25	WR75	R120	**205594-75N-1**	60	—	—	PDR120
14.4–15.35	WR62	R140	**49000-62P-1**	60	—	UG-541A/U UG-419/U	CBR140, UBR140 PBR140

*Also mates with "F" suffix.



General

Circular waveguide is used for long vertical feeder runs in systems where multi-band capability is needed or where low attenuation is critical. The axial symmetry of circular waveguide allows the simultaneous propagation of two orthogonal TE_{11} modes. A single waveguide run can carry two polarizations with 30 dB minimum isolation.

Electrical Characteristics

Closed and Open Systems. Circular waveguide systems which have circular-to-rectangular transitions at both ends are considered "closed" systems. Horn-reflector antennas fed directly with circular waveguide have only one circular-to-rectangular transition (at the bottom) and are considered "open".

Attenuation curves are illustrated on pages 178 and 179. Add 0.3 dB to allow for the transitions in a "closed" system and 0.15 dB in an "open" system.

VSWR (Return Loss, dB) for a complete single-polarized system, of any length, including straight sections and transitions (except 17.7-19.7 GHz), is guaranteed 1.04 (34.2) maximum and is typically 1.03 (36.6) maximum. A similar dual-polarized system is guaranteed 1.06 (30.7) maximum and is typically 1.04 (34.2) maximum. A single or dual polarized 17.7-19.7 GHz system is guaranteed 1.09 (27.3) maximum.

RML (reconverted mode level) is the level of higher order mode energy reconverted to the dominant mode in a circular waveguide system. In a closed system, higher modes become trapped within the circular waveguide because they cannot propagate in the connecting rectangular waveguide. Group delay distortion and noise result when a portion of this energy, delayed in time, is reconverted to the dominant mode. Andrew circular waveguide systems are designed for minimum RML. Each circular-to-rectangular transition includes a non-linear tapered circular-to-circular transition section to minimize the generation of unwanted modes and prevent their propagation into the circular-to-rectangular transition section. In addition, Andrew offers a circular-to-rectangular transition with a built-in mode filter (for TM_{01} and TE_{21}) for use at the bottom of a closed system. These unwanted modes are not trapped in an "open" system and the bottom mode filter is, therefore, not needed. However, depending on the operating frequency, the TM_{11} mode can sometimes be generated in an "open" system and a TM_{11} mode filter (described on page 199) may be required.

Straight Section Ordering Information

Length	Flanges	WC281	WC269	WC205	WC166	WC109
Recommended Operating Bands, GHz***		3.58-4.2 5.925-6.425 10.7-11.7 6.425-7.125	3.58-4.2 5.925-6.425 6.425-7.125	5.925-6.425	5.925-6.425 6.425-7.125 7.125-7.750 7.725-8.500 10.7-11.7	10.7-11.7 12.2-12.7 12.7-13.25 17.7-19.7
20 ft*	Fixed	—	**64269-240**	**53988-240**	**49608-240**	**54346-240**
12 ft, 6-1/4 in	Fixed Swivel/Fixed	**48600A-1** **48600A-2**	— —	— —	**68573-166** **68574-166**	— —
12 ft, 6 in	Fixed Swivel/Fixed	**49607-150** **48613A-150**	— —	— —	**49608-150** **69021-150**	— —
8 ft	Swivel/Fixed	**48613A-96**	**65456-96**	—	**69021-96**	—
2 ft	Swivel/Fixed	—	**65456-24**	**53987-24**	**69021-24**	**54345-24**
Special	Fixed Swivel/Fixed	**49607**** **48613A****	**64269**** **65456****	**53988**** **53987****	**49608**** **69021****	**54346**** **54345****
Weight, lb/ft (kg/m)		3.3 (4.91)	4.0 (5.95)	3.65 (5.43)	2.8 (4.17)	1.2 (1.79)

*Standard straight sections shipped from Scotland are 6 metres.
**Specify length in inches or millimetres.
***For other bands, contact your local Andrew Sales Office listed inside the back cover.

Circular Waveguide Straight Sections

Andrew circular waveguide is made of heavy-wall high conductivity copper tubing, specially coated to prevent corrosion and deterioration of attenuation characteristics. Stainless steel hardware and flange gaskets are included. Order straight sections from table on page 196.

Circular-to-Rectangular Waveguide Transitions

These transitions convert from circular to rectangular waveguides at one or both ends of the vertical run. Transitions include swivel flanges to simplify installation and polarization alignment. Both rectangular waveguide inputs on dual-polarized transitions enter the circular waveguide in the same plane.† This simplifies installation and routing. Alignment pins, flange hardware, pressure gaskets, and circular waveguide taper sections are included with the transition.

"Open" horn-reflector antenna systems use one transition without a mode filter at the bottom of the circular waveguide run. All other antenna systems use transitions at the top and bottom of the circular waveguide run. For these, a transition without a mode filter is used at the top and a transition with a mode filter is used at the bottom.

†Patented United States 3,924,205; Canada 965,852; United Kingdom 1,394,334; Italy 984,278 and pending in other countries.

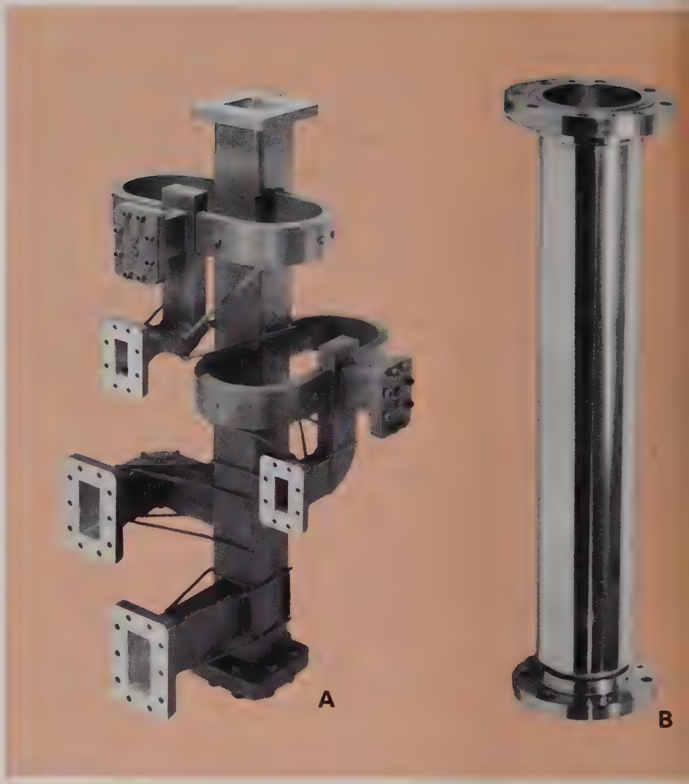
Circular-to-Rectangular Waveguide Transitions

Frequency Band, GHz	Rectangular Flange Mates with EIA or Mil	IEC	Single Polarized** With Mode Filter (A)	Single Polarized** No Mode Filter (B)	Dual Polarized With Mode Filter (C)	Dual Polarized No Mode Filter (D)
WC281						
3.700 – 4.200	CPR229G	PDR40	—	—	—	69385
WC269						
3.700 – 4.200	CPR229G	PDR40	65325	64274A	65326	64270A
WC205						
5.925 – 6.425	CPR137G	PDR70	65234-3	53990A-3	65233-1	64137A-1
5.925 – 6.425	CPR159G	PDR58	—	—	65235	64136A
5.925 – 6.425	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	65234-1	53990A-1	65233-2	64137A-2
WC166						
5.925 – 6.425	CPR137G	PDR70	65239-3	58016A-3	65236-1	62866A-1
5.925 – 6.425	CPR159G	PDR58	—	—	65237-1	64159A-1
5.925 – 6.425	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	65239-1	58016A-1	65236-2	62866A-2
6.425 – 7.125	CPR137G	PDR70	65240-1	64157A-1	65238-1	64147A-1
6.425 – 7.125	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	65240-2	64157A-2	65238-2	64147A-2
7.125 – 7.750	CPR137G	PDR70	65322-1	65321A-1	65324-1	64848A-1
7.125 – 7.750	UG-343B/U, UG-344/U	CAR70, UAR70, PAR70	65322-2	65321A-2	65324-2	64848A-2
7.725 – 8.500	CPR112G	PDR84	65323-3	57459A-3	65316-1	64703A-1
7.725 – 8.500	UG-52B/U, UG-51	CBR84, UBR84, PBR84	65323-2	57459A-2	65316-2	64703A-2
10.700 – 11.700	CPR90G	PDR100	—	—	—	69383
WC109						
10.700 – 11.700	CPR90G	PDR100	65242-107	57222A-107	65241-107	64100A-107
12.200 – 12.700	WR75 Cover/Gasket*	—	65242-122	57222A-122	65241-122	64100A-122
12.700 – 13.250	—	PDR120	—	—	69876	69877
12.700 – 13.250	WR75 Cover/Gasket*	—	67550	67549	68999	68998
17.700 – 19.700	UG-596A/U, UG-595/U	CBR220, UBR220, PBR220	—	—	160515-177‡	160516-177‡

*Andrew "cover/gasket" flanges mate with either choke or cover flanges or the corresponding HELIAX® elliptical waveguide connectors.
**Not applicable for horn-reflector antenna systems. Use dual polarized transition with one port terminated with load (page 199).
‡Includes termination load for single polarized applications.

A Compact 4-Port Combining Network provides simultaneous dual-frequency-band, dual-polarized operation with low VSWR, excellent frequency-band isolation and high polarization isolation. Use taper transitions to match combining network flange to circular waveguide run. See typical systems on pages 16-19. Restrainer (see table) attaches combining network to tower slot angles for applications at bottom of circular waveguide run. Removable end plate permits extraction of most horn system debris without system interruption. Types 201759A and 205136 have provision for direct connection of a WECO water trap. The trap can also be connected to Type 205572 using adaptor Type 205995.

B Taper Transitions convert from one circular waveguide size to another or from circular to square waveguide. Stainless steel hardware and flange gaskets are included.



Taper Transitions

From	To	Transition Type No.	Length in (mm)
Circular-to-Circular Waveguide‡			
WC281 Swivel	WC269	**69273**	6 (152)
WC281 Swivel	WC212	**49545**	18 (457)
WC281 Swivel	WC205	**69272**	18 (457)
WC281 Swivel	WC166	**69271**	18 (457)
WC281 Swivel	WC109	**69269**	18 (457)
WC269 Swivel	WC212	**69492**	18 (457)
WC269 Swivel	WC166	**69270**	18 (457)
WC166	WC109	**69277**	11 (279)
WC166	WC75	**69382**	17 (432)
WC109	WC75	**55648**	6 (152)
Circular-to-Square Waveguide‡			
WC281	WS176	**202559**	30 (762)
WC166	WS108	**205137**	19 (483)

‡For recommended circular waveguide operating bands see page 196. For other bands, contact your local Andrew Sales Office listed inside the back cover.

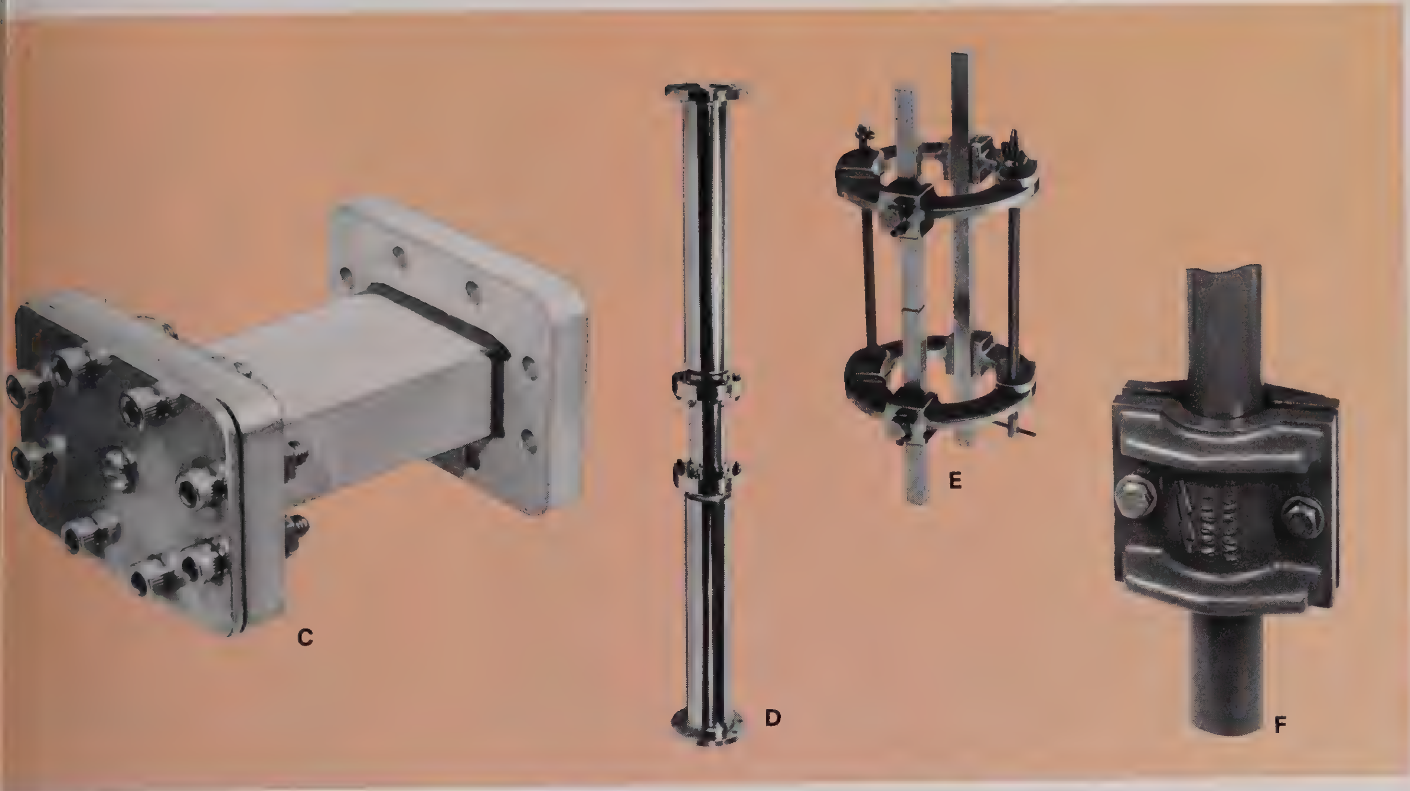
Swivel Flange Adaptor. WC212, 18 in (457 mm) length. Required for attachment of Type 205572 4-port combining network to SHX10C1. Enables swivel polarization adjustment and provides increased clearance .... Type **69585-18**

Network Drain Kit. For horn-reflector antenna systems. Use at bottom of circular to rectangular transition or combining network. Includes manual shut off valve and fittings. With 25 ft (7.6 m) 3/8" polyethylene tubing .... Type **48001**
Without 3/8" tubing (order separately) ... Type **48001-2**

3/8" Polyethylene Tubing, specify length .... Type **25435-5**

Compact 4-Port Combining Networks

Type Number	205572	201759A	205136
Frequency Bands	3.7-4.2 and 5.925-6.425	3.58-4.2 and 6.425-7.125	5.925-6.425 and 10.7-11.7
VSWR, max. (Return Loss, dB)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)
Insertion Loss, dB max.			
Low Band	0.15	0.15	0.15
High Band	0.40	0.40	0.40
Polarization Isolation, dB min.			
Low Band Ports	40	40	40
High Band Ports	40	40	40
Frequency Band Isolation, dB min.			
Low Band at High Band Ports	Below Cutoff	Below Cutoff	Below Cutoff
High Band at Low Band Ports	50	50	50
Flanges Mate with			
Circular or Square Waveguide	WC212	WS176	WS108
Low Band Ports	CPR229G, PDR40	CPR229G, PDR40	CPR137G, PDR70
High Band Ports	CPR137G, PDR70	CPR137G, PDR70	CPR90G, PDR100
Length, in (mm)	23 (584)	24 (610)	18.5 (470)
Weight, lb (kg)	25 (11.4)	25 (11.4)	14 (6.4)
Restrainer Type No.	**49532-2**	**49532-4**	**49532-3**



Nylon Tie Wraps (kit of 50) to fasten tubing (page 198) to tower members .... Type **40417**

C Termination Loads for unused port of 205572.
CPR229G pressurizable .... Type **200807**
CPR137G pressurizable .... Type **39099-137A**

Termination Loads for unused rectangular waveguide port of dual-polarized transitions and multiband networks (except Type 205572). Maximum VSWR is 1.02 within the operating bands specified for transitions. Pressurizable.

Mates with Flange Type(s)	Load Type No.
CPR90G	**62901-90**
CPR112G	**62901-112**
CPR137G	**62901-137**
CPR159G	**62901-159**
CPR229G	**62901-229**
WR75 Choke or Cover	**62900-75**
UG-52/U or UG-51/U	**62900-112**
UG-343B/U or UG-344/U	**62900-137**

D Horn-Reflector System Mode Filter. Reduces group delay ripple generated by TM_{11} higher order mode to less than 3 nanoseconds per hop. Recommended for dual-band systems and single-band systems operating in the higher of the two frequency bands listed in the table. Not required for waveguide runs shorter than 25 feet (7.6 m). Top flange is WC281.

Bottom Flange	Frequency Bands, GHz	Type No.	Length in (mm)
WC281	3.6–4.2, 5.925–6.425	**69907**	42 (1067)
WC281	3.6–4.2, 6.425–7.125	**69908**	72 (1829)
WC281	5.925–6.425, 10.7–11.7	**162240**	78 (1981)
WC269	3.6–4.2, 5.925–6.425	**69485**	42 (1067)
WC166	5.925–6.425, 10.7–11.7	**69910**	57 (1448)

E, F Axial Ratio Compensator. Rotatable clamp installed at the bottom of the circular waveguide run and adjusted to provide maximum polarization isolation. One required for single-polarized run. One, two or three are required (see table) for dual-polarized runs.

Axial Ratio Compensator Ordering Information

For	Photo Ref.	Clamp Type No.	Maximum Length of Waveguide, ft (m) 1 Clamp	2 Clamps	3 Clamps
WC281	E	**48609**	All	–	–
WC269	F	**64271**	200 (60)	400 (120)	600 (180)
WC205	F	**54762**	200 (60)	400 (120)	600 (180)
WC166	F	**57568**	200 (60)	400 (120)	600 (180)
WC109	F	**54348**	150 (45)	300 (90)	450 (135)

Accessories

A Alignment Shorting Plate. A brass plate used during initial alignment. It is installed at the top of the run while the axial ratio compensator is adjusted. See table below.

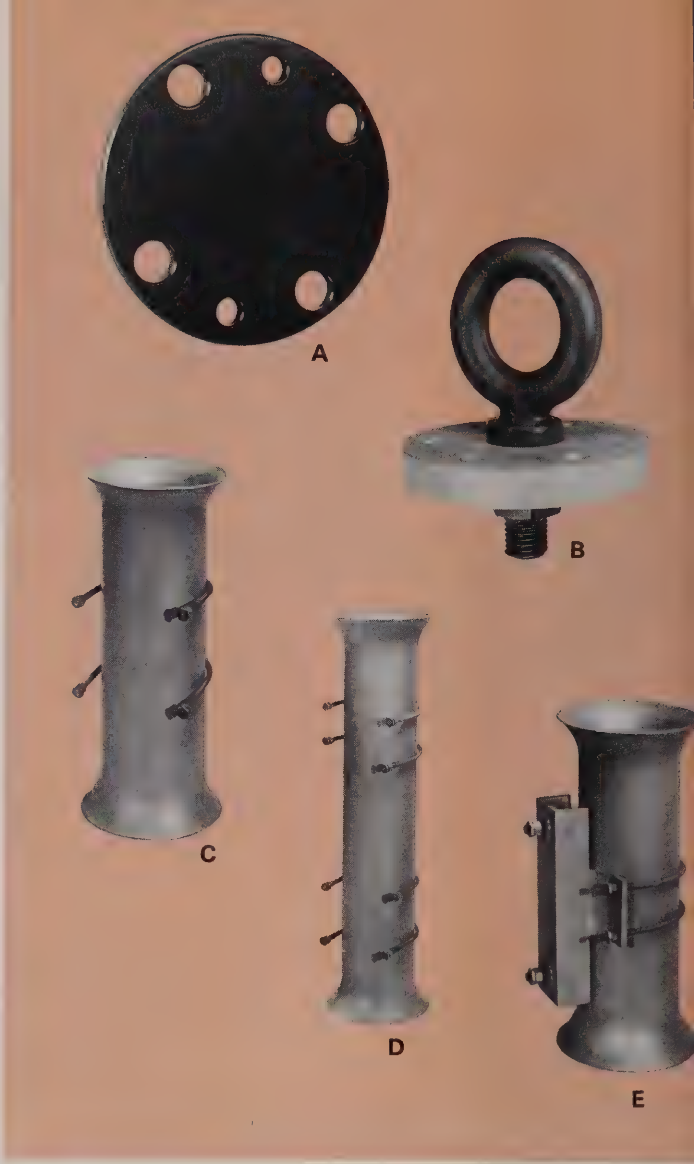
B Pulling Head. Attaches to top waveguide section flange. Waveguide sections can be assembled at ground level and the entire assembly lifted into place on the tower (not required if sections are to be lifted individually and assembled on the tower). See table below.

Current By-Pass Kit. (Not illustrated) Five feet of No. 6 copper wire and lugs to provide a low-loss current path around flexible waveguide sections ...... Type **49486**

WC281 Alignment Tool. (Not illustrated) For placement of axial ratio compensator. Consists of two pairs of rollers in hinged collars with clamp screw ...... Type **48608**

WC281 Waveguide Flange Alignment Wrench (Not illustrated) Vice grip wrench with stainless steel roller bearing chain .... Type **48607**

Flange Hardware Kit. (Not illustrated) Includes a set of hex-head bolts, nuts, lockwashers, and pressure gaskets, sufficient to join two circular waveguide flange units. This hardware kit is provided with each section of circular waveguide and is also available individually. All hardware is stainless steel.



Circular Waveguide Support Systems

The Andrew standard support system uses the rigid, spring/sliding, and sliding hangers presented on page 201. This system is available for all sizes except WC281. Typical system planning information is presented on pages 14, 15, 18 and 19. A second method, for horn-reflector antennas, is KS compatible and uses sliding restrainers. It is available for WC281 and WC166. Typical system planning information is presented on pages 20 and 21.

KS Compatible Circular Waveguide Support System Components

In this system the entire weight of the circular waveguide run is supported at the mounting frame assembly of the horn-reflector antenna using the waveguide support assembly and support plate. The Wilson bolt assembly allows precision height adjustment of the waveguide run and sliding restrainers restrict the lateral movement of the waveguide.

The waveguide support assembly, support plate and Wilson bolt assembly are described on page 91.

C Sliding Restrainer, 18 in (460 mm). Position every 12 ft 6-1/4 in at all circular waveguide flange joints. Includes two 3/8" x 6 in on-center U-bolts and hardware to interface with customer supplied support brackets. See table at right.

D Sliding Restrainer, 30 in (760 mm). Position every 12 ft 6-1/4 in at all circular waveguide flange joints. Used in place of item C (above) beyond 175 ft (55 m) below the support plate for certain KS tower applications. Includes four 3/8" x 6 in on-center U-bolts and hardware to interface with customer supplied support brackets. See table below.

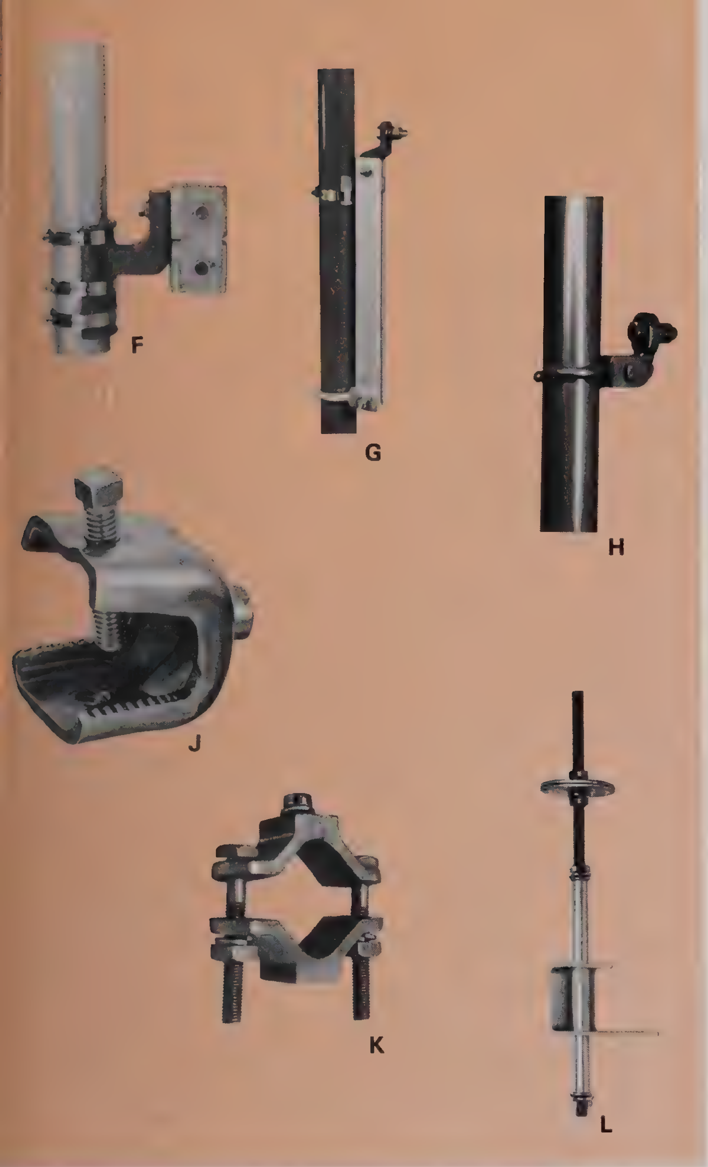
E Sliding Restrainer, Bottom. Use on flange joint at the bottom of the circular waveguide run. Includes bracket and hardware for attachment to network slot angles. See table below.

Sliding Restrainer Type Numbers

Size	18 in (460 mm)	30 in (760 mm)	Bottom
WC281	48602	48603	48604
WC166	49008	49009	49010

Components

	WC281	WC269	WC205	WC166	WC109
Alignment Shorting Plate	64382	64272	54827	57569	56207
Pulling Head	64775-281	64775-269	64775-205	64775-166	64775-109
Flange Hardware Kit	48614	64412	53896	57570-1	54109



Andrew Standard Circular Waveguide Support System Components

Hangers are used to mount circular waveguide in a spring-suspended system on a tower or other support structure and to accommodate the differential expansion and contraction between the waveguide and the tower or support structure. Hangers are brass with 3/8" stainless steel mounting hardware.

Tower members should be drilled only with the consent of the tower manufacturer because of possible weakening of the structure. If holes are not provided and cannot be drilled, angle members or round member adaptors are used to attach the hangers to the tower.

F Rigid Hangers anchor the circular waveguide to the tower at the top of the waveguide run. (Includes heavy-duty angle adaptor.)

G Spring/Sliding Hangers support the waveguide, limit lateral motion, and accommodate differential expansion and contraction.

H Sliding Hangers limit lateral motion.

Adaptors

J Angle Member Adaptor Kit for mounting sliding or spring/sliding hangers to angle or flat tower members up to 7/8 in (22 mm) thick .... Type **13555A**

K Round Member Adaptor kit of 10. Includes two cast iron clamp halves with stainless steel hardware for mounting hangers to round tower members 1-3 in (25-75 mm) in diameter .... Type **65500**

Hangers

Waveguide	Rigid	Sliding	Spring/Sliding
WC269	19007A-269	—	19009A-269
WC205	19007A-205	—	19009A-205
WC166	69932	69933	69934
WC109	19007A-109	19008A-109	19009A-109

Hanger Placement

One rigid hanger is required 6 to 12 in (150 to 300 mm) below the top waveguide section flange. For horn-reflector antenna systems, the rigid hanger is used only during installation. It is replaced with a spring/sliding hanger after the waveguide run is in place. For WC109 and WC166, sliding hangers and spring/sliding hangers are used alternately at 8 to 13 ft (2.4 to 4.0 m) intervals. For WC205 and WC269, spring/sliding hangers are positioned every 8 to 13 ft (2.4 to 4.0 m). See pages 14, 15, 18 and 19 for system planning details.

Connecting Waveguides

The circular waveguide run is connected to the antenna and the radio equipment using HELIAX® elliptical waveguide and/or rectangular waveguide components. These are described in detail on pages 180-194 and 202-209.

L Elliptical Waveguide Sliding Support. For use with 4-port combiner or dual polarized circular-to-rectangular transition to eliminate the requirement for flexible waveguide sections. Accommodates vertical movement and provides support to the elliptical waveguide near the network end of the run. Use with elliptical waveguide hangers described on page 190 .... Type **200970**

Elliptical Waveguide Twist. A special 14 ft (4.2 m) elliptical waveguide twist section for connection between the antenna and the top dual polarized transition is described on page 194. This unit includes a factory formed 90° twist and can be trimmed in the field for assembly lengths from 3 to 14 ft (1 to 4.2 m).

Pressurization

Microwave waveguides should be maintained under dry air or dry nitrogen pressure to prevent moisture condensation. All sizes are pressurizable to 10 lb/in^2 (70 kPa). Check antenna pressurization limits to ensure antenna limits are not being exceeded. Pressurization equipment is described on pages 277-285.

Rectangular Waveguide with CPR137G Flange

Introduction

Rectangular waveguide components are offered for use with HELIAX® elliptical waveguide and circular waveguide feeder systems. Straight sections are fabricated from high-conductivity copper or 90/10 bronze with MIL, EIA or IEC flanges. Each component is chemically cleaned and coated for corrosion protection.

Andrew offers rectangular waveguides in standard and premium VSWR types. Premium waveguides and components use CPR flanges and feature lower VSWR. They are recommended for use with circular waveguide components and premium HELIAX elliptical waveguides (EWP series).

Standard waveguides and components use choke and cover flanges. These are offered for use in conjunction with standard HELIAX elliptical rectangular waveguides (EW series).

Waveguide straight sections and components are also available with CMR flanges on one end and CMR, CPR, choke or cover flanges on the other. These flanges are described on pages 208 and 209.

All flanged components include flange gaskets, sockethead screws, lockwashers and nuts (where applicable), except as noted. Items with similar flanges on both ends include one set of flange hardware. If flanges are different, a hardware kit for each flange is included. All flange hardware is stainless steel.

For dimensional and other information on rectangular waveguide, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1057.

Electrical Characteristics

Operating Band. The operating band listed below is the EIA recommended frequency range for the dominant TE_{10} mode. The maximum VSWR ratings listed in the table on page 203 apply to the entire operating band for standard waveguide components. For low VSWR premium waveguide it is necessary to specify the desired band from the low VSWR bands given in the table. Special bands must be within the operating band.

Attenuation curves for rectangular waveguides are presented on pages 178 and 179.

Rectangular Waveguide Data

Operating Frequency Band, GHz	For Equivalent Waveguide Types EIA	U.S. MIL	British	IEC	Inside Dimensions Inches (mm)	Low VSWR Normal Band† GHz	Low VSWR Special Max. Bandwidth† MHz
18.00 – 26.50	WR42	RG-53/U	WG20	R220	0.420 x 0.170 (10.67 x 4.32)	—	—
12.40 – 18.00*	WR62	RG-91/U	WG18	R140	0.622 x 0.311 (15.80 x 7.90)	—	—
10.00 – 15.00**	WR75	RG-346/U	WG17	R120	0.750 x 0.375 (19.05 x 9.53)	—	—
8.20 – 12.40	WR90	RG-52/U	WG16	R100	0.900 x 0.400 (22.86 x 10.16)	10.300-10.700 10.700-11.700	1000
7.05 – 10.00	WR112	RG-51/U	WG15	R84	1.122 x 0.497 (28.50 x 12.62)	7.125-7.750 7.750-8.500	850
5.85 – 8.20	WR137	RG-50/U	WG14	R70	1.372 x 0.622 (34.85 x 15.80)	5.925-6.425 6.425-7.125 7.125-7.750	600
4.90 – 7.05	WR159	RG-343/U	WG13	R58	1.590 x 0.795 (40.39 x 20.19)	5.925-6.425	600
3.95 – 5.85	WR187	RG-49/U	WG12	R48	1.872 x 0.872 (47.55 x 22.15)	4.400-5.000	600
3.30 – 4.90	WR229	RG-340/U	WG11A	R40	2.290 x 1.145 (58.17 x 29.08)	3.540-4.200 3.700-4.200	—

*14.4-15.35 for flex-twist. **10.7-13.25 for flex-twist. † Specify frequency band. Other frequency bands available on request.

Component Descriptions

Ordering information for the components described on this page is given on pages 204 and 205.

Straight Sections are provided in standard lengths of 5 and 10 feet (1.5 and 3 metres) and in special lengths up to 20 feet (6 metres).

Flex-Twist sections are frequently used to accommodate some misalignment between feeders and radio equipment or antennas, and to isolate radio equipment from tower induced vibrations. These sections are fabricated from spiral-wound, silver-plated, brass conductors and include pressure-tight, protective, neoprene jackets. Allowable twist ranges from 100°/ft (330°/m) for WR75 to 45°/ft (150°/m) for WR229. Standard lengths are 1, 2 and 3 feet (0.3, 0.6 and 0.9 metres). Other lengths are available on special order. High power versions for earth station applications are listed in the table below.

90° E-Plane Elbow. Various flange combinations and leg lengths are available.

90° H-Plane Elbow. Various flange combinations and leg lengths are available.

90° Twist Section is used to rotate plane of polarization.

Premium 90° Step-Twist is used to rotate plane of polarization where space is limited.

Pressure Inlet is 0.62-1 in (16-25 mm) thick, depending on waveguide size, machined brass section with 1/8 inch female pipe thread and plug. Unit does not have a pressure window.

Flange Gaskets (not shown). Full or half-thickness pressure gasket for one flange connection. Use of half-thickness gasket is explained on page 208.

Pressure Window is 0.06 inch (1.5 mm) thick. Maximum pressure is 10 lb/in^2 (70 kPa). Unit does not have a pressure inlet. High power versions for earth station applications are listed in the table below.

Field Flanges are for field fabrication of waveguide sections for use on interior waveguide runs. Flange hardware and pressure gasket are included. Use soft solder to attach.

Hardware Kit (not shown). Spare set of hardware and a pressure gasket for one flange connection. Choke/cover and CMR kits include a full gasket, socket-head screws and lock washers. CPR kit also includes nuts.

VSWR, Maximum per Component

Component	Low VSWR Max. VSWR (R.L., dB)‡‡	Standard Max. VSWR (R.L., dB)‡
Straight Section	1.02 (40.1)	1.05 (32.3)
Flex-Twist (Except WR42 and High Power)	1.03 (36.6)	1.10 (26.4)
Flex-Twist, WR42	—	*
Flex-Twist, High Power	1.10 (26.4)	1.10 (26.4)
90° E- or H- Plane Elbow	1.02 (40.1)	1.05 (32.3)
90° Twist	1.02 (40.1)	1.06 (30.7)
Premium 90° Step-Twist†	1.02 (40.1)	—
Premium Flex (No Twist)	1.03 (36.6)	—
Pressure Inlet	1.01 (46.1)	1.01 (46.1)
Pressure Window (Except High Power)	1.01 (46.1)	1.04 (34.2)
Pressure Window, High Power	1.10 (26.4)	1.10 (26.4)
Pressure Window/Inlet	—	1.04 (34.2)

*For 17.7-19.7 GHz, 1.15 (23.1) up to 12 in, 1.2 (20.8) from 12 to 36 in. For 18-26.5 GHz, 1.2 (20.8) up to 12 in, 1.25 (19.1) from 12 to 36 in.
†Available only for bands specified on page 202.
‡Over waveguide operating band except where otherwise indicated.
‡‡Low VSWR premium components over specified low VSWR band.

High Power Components for Earth Station Applications

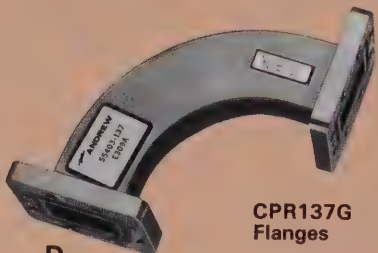
Waveguide Size	Frequency Band, GHz	Flex Twist & Flex (No Twist) 1 ft (0.3 m)	2 ft (0.6 m)	3 ft (0.9 m)	Pressure Window Type No.	Average Power Watts	Flange	VSWR max. (R.L., dB)
Flex-Twist Section								
WR137	5.925-6.425	**162047-12**	**162047-24**	**162047-36**	—	3300	CPR137G	1.10 (26.4)
WR75	14.0-14.5	**163228-12**	**163228-24**	**163228-36**	—	850	Cover and Cover/Gasket	1.10 (26.4)
Flex (No Twist) Section								
WR137	5.925-6.425	**162048-12**	**162048-24**	**162048-36**	—	5300	CPR137G	1.10 (26.4)
WR75	14.0-14.5	**162615-12**	**162615-24**	**162615-36**	—	1300	Cover and Cover/Gasket	1.10 (26.4)
Pressure Window								
WR137	5.925-6.425	—	—	—	**202378**	1000	CPR137G	1.10 (26.4)
					202378-2	5000	CPR137G	1.10 (26.4)
WR75	14.0-14.5	—	—	—	**202378-3**	2000	Choke and cover	1.10 (26.4)

See component descriptions on page 203. Pictures are representative, except for flanges, of both standard and low VSWR components. All flanged components include a set of hardware and a flange gasket where applicable.

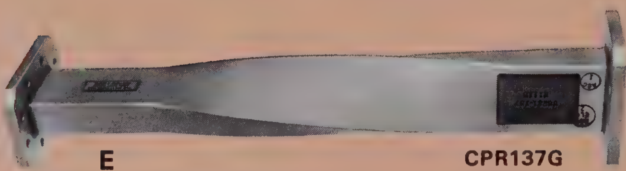
A CPR137G Flanges

C CPR137G Flanges

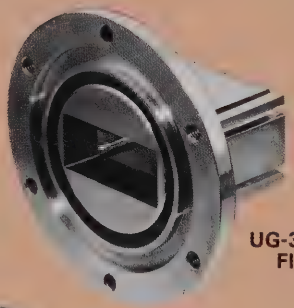
B CPR137G Flanges



D CPR137G Flanges

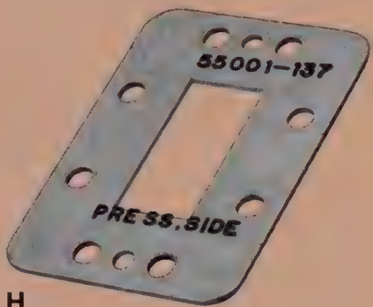


E CPR137G Flanges



I UG-343B/U Flange

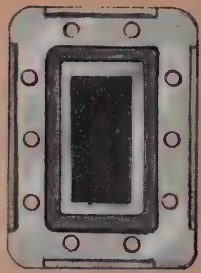
F CPR137G Flanges



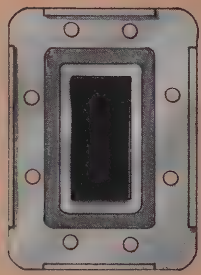
H Mates with CPR137G Flange

G UG-343B/U Flange

Flanges for Low VSWR Components.
For detailed information on flanges, see pages 208 and 209.

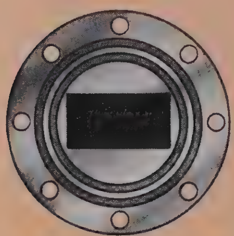


CPR229G

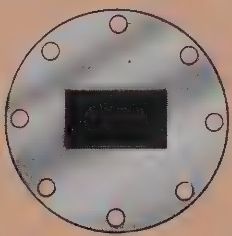


CPR187G
CPR159G
CPR137G
CPR112G
CPR90G

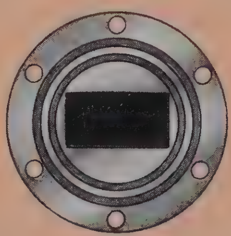
Flanges for Standard Components.
For detailed information on flanges, see pages 208 and 209.



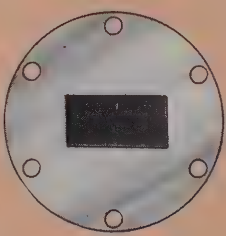
UG-148C/U



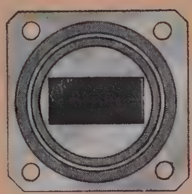
UG-149A/U



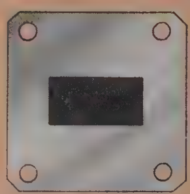
UG-343B/U



UG-344/U



UG-52B/U
UG-40B/U
WR75 Choke
UG-541A/U
UG-596A/U



UG-51/U
UG-39/U
WR75 Cover
UG-419/U
UG-595/U

Low VSWR Component Type Numbers

Specify Frequency Band. See page 202

Waveguide EIA / IEC / British	WR229 R40 WG11A	WR187 R48 WG12	WR159 R58 WG13	WR137 R70 WG14	WR112 R84 WG15	WR90 R100 WG16
Flanges*	CPR229G	CPR187G	CPR159G	CPR137G	CPR112G	CPR90G
A Straight Section						
5 ft (1.5 m)	55420-60	55418-60	55416-60	55414-60	55412-60	55410-60
10 ft (3.0 m)	55420-120	55418-120	55416-120	55414-120	55412-120	55410-120
Special Length**	55420	55418	55416	55414	55412	55410
B 1 ft (0.3 m) Flex-Twist	55421-12	55419-12	55417-12	55415-12	55413-12	55411-12
B 2 ft (0.6 m) Flex-Twist	55421-24	55419-24	55417-24	55415-24	55413-24	55411-24
B 3 ft (0.9 m) Flex-Twist	55421-36	55419-36	55417-36	55415-36	55413-36	55411-36
C 90° E-Plane Elbow	55402-229	55402-187	55402-159	55402-137	55402-112	55402-90
D 90° H-Plane Elbow	55403-229	55403-187	55403-159	55403-137	55403-112	55403-90
E 90° Twist	55407-229	55407-187	55407-159	55407-137	55407-112	55407-90
F Premium 90° Step-Twist	65230-229-1‡	—	65230-159†	65230-137††	—	—
B 2 ft (0.6 m) Premium Flex (No Twist)	—	—	—	65168-24	—	—
G Pressure Inlet	55674-229	55674-187	55674-159	55674-137	55674-112	55674-90
H Pressure Window	55001-229	55001-187	55001-159	55001-137	55001-112	55001-90
Flange Hardware Kit***	55219-229	55219-187	55219-159	55219-137	55219-112	55219-90
Flange Gasket, Full***	31619	55688	54769	28030	32349	31861
Flange Gasket, Half***	55072-229	55072-187	55072-159	55072-137	55072-112	55072-90

*Components with CMR flanges on one or both ends are also available.
**Specify length in inches or millimetres.
***Flange gasket has rectangular cross-section.

†5.925 – 6.425 GHz only.
††5.925 – 6.425, 6.425 – 7.125 or 7.125 – 7.750 GHz only.
‡3.7 – 4.2 GHz only.

Standard Component Type Numbers

Waveguide Size EIA / IEC / British	WR187 R48 WG12	WR137 R70 WG14	WR112 R84 WG15	WR90 R100 WG16	WR75 R120 WG17	WR62 R140 WG18	WR42 R220 WG20
Frequency Band, GHz	3.95-5.85	5.8-8.2	7.05-10.0	8.2-12.4	10.0-15.0	12.4-18.0	18.0-26.5
Flanges*, Choke	UG-148C/U	UG-343B/U	UG-52B/U	UG-40B/U	Choke	UG-541A/U	UG-596A/U
Cover	UG-149A/U	UG-344/U	UG-51/U	UG-39/U	Cover	UG-419/U	UG-595/U
A Straight Section							
5 ft (1.5 m)	52080-60	19065-60	19045-60	19051-60	51741-60	53210-60	53296-60
10 ft (3.0 m)	52080-120	19065-120	19045-120	19051-120	51741-120	53210-120	53296-120
Special Length**	52080	19065	19045	19051	51741	53210	53296
B 1 ft (0.3 m) Flex-Twist	52095-12	19075-12	51727-12	51737-12	51747-12†	53215-12‡	163619-12
B 2 ft (0.6 m) Flex-Twist	52095-24	19075-24	51727-24	51737-24	51747-24†	53215-24‡	163619-24
B 3 ft (0.9 m) Flex-Twist	52095-36	19075-36	51727-36	51737-36	51747-36†	53215-36‡	163619-36
C 90° E-Plane Elbow	55220-187	55220-137	55220-112	55220-90	55220-75	55220-62	55220-42
D 90° H-Plane Elbow	55221-187	55221-137	55221-112	55221-90	55221-75	55221-62	55221-42
E 90° Twist Section	55222-187	55222-137	55222-112	55222-90	55222-75	55222-62	55222-42
G Pressure Inlet	55675-187	55675-137	55675-112	55675-90	55675-75	55675-62	55675-42
H Pressure Window	55000-187	55000-137	55000-112	55000-90	55000-75	55000-62	55000-42
G Pressure Window/Inlet	53648-187	53648-137	53648-112	53648-90	53648-75	53648-62	53648-42
I Field Choke Flange	53015-187	53015-137	53015-112	53015-90	53015-75	53015-62	53015-42
Field Cover Flange	53025-187	53025-137	53025-112	53025-90	53025-75	53025-62	53025-42
Flange Hardware Kit***	55224-187	55224-137	55224-112	55224-90	55224-75	55224-62	55224-42
Flange Gasket***	10683-307	10683-304	10683-305	10683-329	10683-312	10683-319	10683-328

*Components with CMR flanges on one end and choke or cover on the other are also available.
**Specify length in inches or millimetres.
***Flange gasket has rectangular cross-section.

†10.7-13.25 for flex-twist.
‡14.4-15.35 for flex-twist.

A Flange Adaptor. Length is 4 in (100 mm). Commonly used adaptors are listed in the table. Other flange combinations and lengths are available.

B Transition to Type N Jack (Female). Mates with Type N plug (male). Not pressurizable.

C Tapered Waveguide Transition. Commonly used transitions are listed in the table. Other size and flange combinations are available.

Flange Adaptor

Flange Type	and Flange Type	A Type No.	VSWR max. (R.L., dB)
UG-51/U	CPR112G	**55526-4**	1.05 (32.3)
UG-52B/U	CPR112G	**55974-4**	1.05 (32.3)
UG-343B/U or -344†	CPR137G	**55249-4**	1.05 (32.3)
CMR90	CPR90G	**55437-90**	1.05 (32.3)
CMR112	CPR112G	**55437-112**	1.05 (32.3)
CMR137	CPR137G	**55437-137**	1.05 (32.3)
CMR159	CPR159G	**55437-159**	1.05 (32.3)
CMR229	CPR229G	**55437-229**	1.05 (32.3)

†Compatible choke or cover type.

Transition to N Jack

Waveguide	Flange Type	B Type No.	VSWR Max. (R.L., dB)
WR229	CPR229G	**54418-229**	1.3 (17.7)
WR229	CPR229G	**163950-229**	1.1 (26.4)*
WR159	CPR159G	**54418-159**	1.3 (17.7)
WR159	CPR159G	**163950-159****	1.1 (26.4)
WR137	CPR137G	**54418-137**	1.3 (17.7)
WR137	CPR137G	**163950-137****	1.1 (26.4)
WR137	UG-344/U	**59210-137**	1.3 (17.7)
WR112	CPR112G	**54418-112**	1.3 (17.7)
WR112	CPR112G	**163950-112****	1.1 (26.4)
WR112	UG-51/U	**59210-112**	1.3 (17.7)
WR90	CPR90G	**54418-90**	1.3 (17.7)
WR90	CPR90G	**163950-90****	1.1 (26.4)
WR90	UG-39/U	**59210-90**	1.3 (17.7)
WR75	WR75 cover	**59210-75†**	1.5 (14.0)

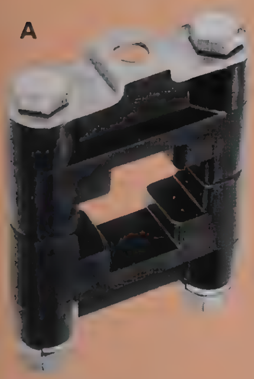
*3.7-4.2 GHz only.
**Specify low VSWR frequency band. See page 202.
†10.0-13.2 GHz.

Tapered Transition

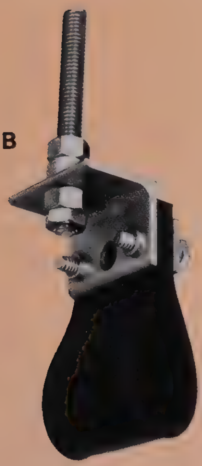
One Flange Mates with	Other Flange Mates with	C Type Number	Length in (mm)	VSWR max. (R.L., dB)
UG-148C/U UG-149A/U†	CPR137G	**59220-24‡**	6 (152)	1.06 (30.7)
CPR159G	CPR137G	**59220-37**	6 (152)	1.06 (30.7)
CPR159G	UG-343B/U UG-344/U†	**59220-30**	6 (152)	1.06 (30.7)
CMR159	CMR137	**59220-100**	6 (152)	1.06 (30.7)
CPR137G	CPR112G	**59220-33**	7.5 (190)	1.06 (30.7)
CPR137G	UG-52B/U UG-51/U†	**59220-25**	7.5 (190)	1.06 (30.7)
UG-343B/U UG-344/U†	UG-52B/U UG-51/U	**59220-5**	7.5 (190)	1.06 (30.7)
UG-52B/U UG-51/U†	UG-40B/U UG-39/U†	**59220-6**	6 (152)	1.06 (30.7)
CPR90G	WR75 choke or cover	**59220-51**	6 (152)	1.06 (30.7)
UG-40B/U UG-39/U†	WR75 choke or cover	**59220-13**	6 (152)	1.06 (30.7)

†Compatible choke or cover type.
‡Specify frequency band.

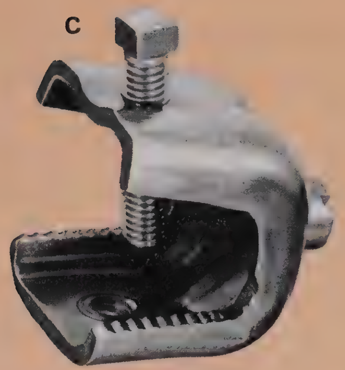
A



B

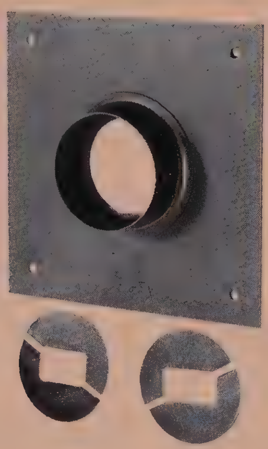


C



D

E



Hangers. Hardware is stainless steel. Attach using angle adaptor or threaded rod support kit described below.

A Rigid Hanger .... Type **19007-(*)**

A Sliding Hanger .... Type **19008-(*)**

*Insert numeral portion of EIA waveguide designation, i.e., 19007-137 is rigid hanger for WR137 waveguide.

B Flex-Twist Section Hanger. Use to minimize vibration and movement. Includes 3/8" diameter, 24 in (610 mm) long stainless steel threaded rod, nuts and washers.

Waveguide	Type No.
WR229	**66412-229**
WR159	**66412-159**
WR137	**66412-137**
WR90	**66412-90**

Current By-Pass Kit. Five feet (1.5 m) of No. 6 copper wire and lugs to provide a low-loss current path around flexible waveguide sections ..... Type **49486**

C Angle Adaptor Kit. Includes 10 stainless steel clamps to mount hangers to angle support members up to 7/8 in (22 mm) thick .... Type **31768A**

D Threaded Rod Support Kit. Stainless steel. Use to mount hangers away from supporting structure, under waveguide bridge and inside equipment room. Includes 3/8" diameter threaded rod, nuts and washers. Attach to ceiling using included ceiling mounting plate.

12 in (305 mm) rod .... Type **31771**
12 in (305 mm) rod, kit of 5 .... Type **31771-4**
24 in (610 mm) rod .... Type **31771-9**
24 in (610 mm) rod, kit of 5 .... Type **31771-6**

E Wall/Roof Feed-Thru. Consists of 0.1 in (3 mm) steel plate, split rubber washers, and plastic sealing compound for a single waveguide run. Units for multiple runs are available on special order ... Type **55040-(*)**

*Insert numeral portion of EIA waveguide designation, i.e., 55040-137 is wall/roof feed-thru for single run of WR137 waveguide.

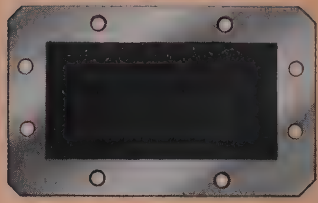


Figure 6

Unpressurizable Contact Flange – Always Rectangula

Rectangular Waveguide Flanges

A majority of Andrew standard flanges utilized in North America are based on EIA (Electronic Industry Association) or U.S. Military (MIL) standards. IEC (International Electrotechnical Commission) standards are utilized throughout other parts of the world. EIA, MIL and IEC flanges are compatible but not identical. Variations in equivalent flanges include slight differences in nominal dimensions, tolerances, gasket style and thickness, and addition or deletion of alignment pins and holes or alignment bolts. Compatible flanges are listed in the tables on the following pages according to type. The three basic types of flanges utilized throughout the industry are pressurizable contact, unpressurizable contact, and choke/cover flanges. It should be noted that these three flange types are not interchangeable.

Pressurizable Contact Flanges

The CPR and PDR series contact flanges are pressurizable and require gaskets for mating with similar contact flanges. All CPR and PDR series flanges are rectangular in shape and have clear holes secured with bolts and nuts. Appropriate flange gaskets are required to assure proper sealing of similar contact flanges.

CPR (G Series) Contact Flanges are mated using either one full-thickness or two half-thickness gaskets. When utilizing two half-thickness gaskets, either rectangular or D-shaped gasket cross sections are required.

CPR (F Series) Contact Flanges are mated using a special seal. However, mating of CPR G series and F series flanges requires only one half-thickness gasket, available in the table on page 205.

PDR Series Contact Flanges utilize different gaskets and have deeper gasket grooves. CPR and PDR flanges can be mated by using one PDR gasket and one CPR half-thickness gasket. Small tolerance differences using U.S. or metric hardware to mate CPR/PDR flanges result in negligible VSWR contributions.

Pressure Windows normally do not have gasket grooves but include one CPR half-thickness gasket for mating with CPR G series flanges.

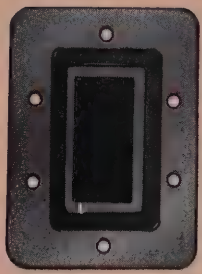


Figure 1

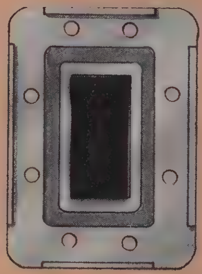


Figure 2

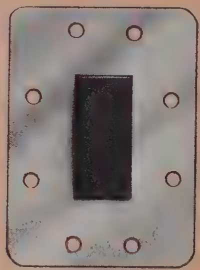


Figure 3

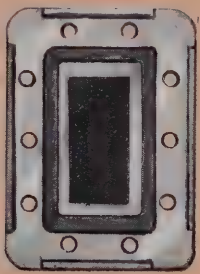


Figure 4

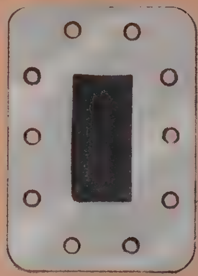


Figure 5

Various Contact Flanges – Always Rectangular

Pressurizable Contact Flanges

Waveguide Type, EIA	With Groove EIA	With Groove MIL Type	With Groove IEC	Fig. No.	Without Groove EIA	Without Groove MIL Type	Fig. No.	Dimensions, Inches (Millimetres)
WR75	Pressurizable Contact Flange			2	—	—	—	1.70 x 1.32 (43.2 x 33.7)
WR75	—	—	PDR120	1	—	—	—	1.94 x 1.57 (49.2 x 39.9)
WR90	CPR90G	UG-1360/U	PDR100*	2	CPR90F	UG-1736/U	3	2.09 x 1.59 (53.1 x 40.4)
WR112	CPR112G	UG-1358/U	PDR84*	2	CPR112F	UG-1734/U	3	2.50 x 1.75 (63.5 x 44.5)
WR137	CPR137G	UG-1356/U	PDR70**	2	CPR137F	UG-1732/U	3	2.69 x 1.94 (68.3 x 49.3)
WR159	CPR159G	UG-1354/U	PDR58	2	CPR159F	UG-1730/U	3	3.19 x 2.44 (81.0 x 62.0)
WR187	CPR187G	UG-1352/U	PDR48	2	CPR187F	UG-1728/U	3	3.50 x 2.50 (88.9 x 63.5)
WR229	CPR229G	UG-1350/U	PDR40	4	CPR229F	UG-1726/U	5	3.88 x 2.75 (98.6 x 69.9)
WR284	CPR284G	UG-1348/U	PDR32	4	CPR284F	UG-1724/U	5	4.50 x 3.00 (114 x 76.2)
WR340	CPR340G	UG-1346/U	PDR26	4	CPR340F	UG-1712/U	5	5.44 x 3.75 (138 x 95.3)
WR430	CPR430G	UG-1344/U	PDR22	4	CPR430F	UG-1716/U	5	6.34 x 4.19 (161 x 106)

*Mates with equivalent CPR series flange with 4 mm hardware only.

**Mates with equivalent CPR series flange with U.S. #10 hardware only.

Unpressurizable Contact Flanges

The CMR and UER Series Contact Flanges are not pressurizable and do not require gaskets. CMR flanges are always rectangular in shape, have alternate tapped and clear holes and are secured with bolts only. The IEC equivalents have all clear holes and are secured with bolts, nuts and lockwashers.

Unpressurizable Contact Flanges

Waveguide Type, EIA	Flange Series Equivalents EIA	IEC	Fig. No.	Dimensions, Inches (Millimetres)
WR90	CMR90	UER100	6	1.77 x 1.27 (45.0 x 32.3)
WR112	CMR112	UER84	6	2.02 x 1.38 (51.3 x 35.1)
WR137	CMR137	UER70	6	2.28 x 1.53 (57.9 x 38.9)
WR159	CMR159	UER58	6	2.50 x 1.75 (63.5 x 44.5)
WR187	CMR187	UER48	6	2.78 x 1.78 (70.6 x 45.2)
WR229	CMR229	UER40	6	3.16 x 2.00 (80.3 x 50.8)
WR284	CMR284	UER32	6†	3.84 x 2.34 (97.5 x 59.4)

† Flange shape is similar to diagram but has twelve bolt holes.

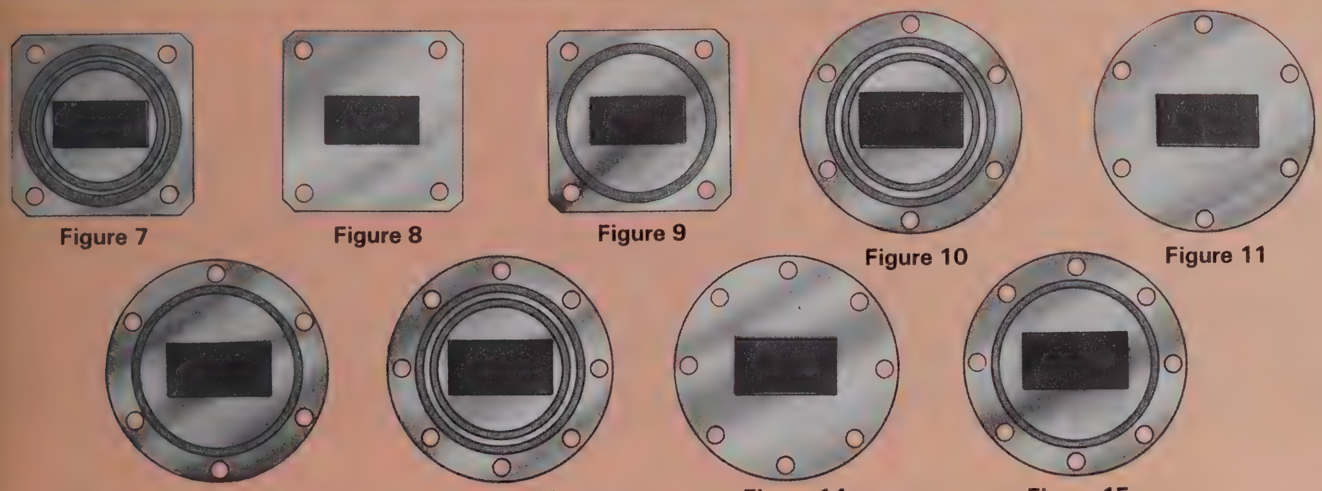


Figure 7 Figure 8 Figure 9 Figure 10 Figure 11
Figure 12 Figure 13 Figure 14 Figure 15

Various Choke/Cover Flanges – Always Square or Round

Choke/Cover Flange

CBR, CAR and Equivalent UG Series Choke Flanges include a gasket groove, choke, and tapped holes for mating with cover flanges. Two choke flanges cannot be mated.

UBR, UAR and Equivalent UG Series Cover Flanges are flat, without a gasket groove, and have clear holes for mating with choke flanges and other cover flanges. Use of a special seal is required for pressurization of two mating cover flanges.

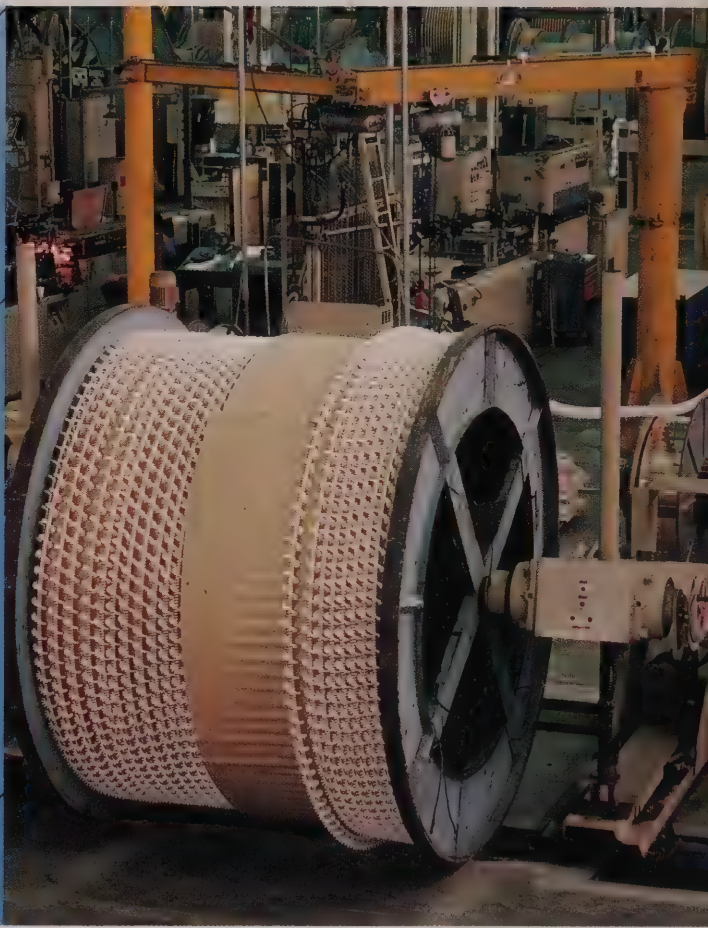
PBR and PAR Series Cover/Gasket Flanges are flat, include a gasket groove, and have clear holes for mating with cover, choke, or other cover/gasket flanges. Cover/gasket flanges utilize a single gasket when mated with cover flanges and a double gasket when mated with choke flanges or other cover/gasket flanges. When using a double gasket, at least one should have a rectangular cross section.

Choke, Cover and Cover/Gasket Flanges

Waveguide Type, EIA	Choke Flanges U.S. MIL	IEC	Fig. No.	Cover Flanges U.S. MIL	IEC	Fig. No.	Cover/Gasket Flanges IEC	Fig. No.	Flange Dimensions Inches (Millimetres)
WR42	UG-596A/U	CBR220	7	UG-595/U	UBR220	8	PBR220	9	0.88 (22.4) sq.
WR62	UG-541A/U	CBR140	7	UG-419/U	UBR140	8	PBR140	9	1.31 (33.3) sq.
WR75	51752*	CBR120	7	51745*	UBR120	8	PBR120	9	1.50 (38.1) sq.
WR90	UG-40B/U	CBR100	7	UG-39/U	UBR100	8	PBR100	9	1.63 (41.4) sq.
WR112	UG-52B/U	CBR84	7	UG-51/U	UBR84	8	PBR84	9	1.88 (47.8) sq.
WR137	UG-343B/U	CAR70	10	UG-344/U	UAR70	11	PAR70	12	3.13 (79.5) dia.
WR159	—	CAR58	10	—	UAR58	11	PAR58	12	3.38 (85.9) dia.
WR187	UG-148C/U	CAR48	13	UG-149A/U	UAR48	14	PAR48	15	3.63 (92.2) dia.
WR284	UG-54B/U	CAR32	13**	UG-53/U	UAR32	14**	PAR32	15**	5.31 (134.9) dia.

*Andrew type numbers for WR75 flanges.

**Bolt hole positions are rotated 22.5 degrees from the positions shown.



Application

HELIAX coaxial cables and connectors* are ideally suited for any application where use of coaxial transmission line is indicated. Many millions of feet of HELIAX cable have gone into service over the past 30 years. Installations date back to the 1950's.

Long continuous lengths provide ease of installation and maintenance-free service not found in rigid coaxial lines or in other coaxial cables. The copper, corrugated outer conductors (and inner conductors of the larger sizes) provide a unique combination of strength and flexibility.

HELIAX coaxial cables are lighter and more flexible than smooth-wall aluminum cables, more permanent and trouble-free than braided cables and are electrically superior to both.

All HELIAX coaxial cables are jacketed for direct burial or for corrosive environmental conditions. Standard jacketing material is weather-resistant polyethylene suitable for operation down to –54°C (–65°F) and installation down to –40°C (–40°F).

High temperature and fire-retardant jacketing is also available for special applications.

HELIAX is the registered trademark under which semi-flexible coaxial cables are sold by Andrew.
*These cables and connectors are proprietary products of Andrew manufactured under patents issued and pending.

Production

HELIAX coaxial cables are produced by a continuous process. Much of the proprietary equipment used for production of the cable has been designed and built by Andrew. The process begins by winding an insulator strip, in the case of air-dielectric cable, or extruding a low-loss foam core in the case of foam-dielectric cable, onto an accurately sized inner conductor. Copper strip stock is then formed into a tube around the previous assembly, welded, and corrugated for flexibility. The entire assembly is then jacketed with black, weather-resistant polyethylene.

Connectors complement the cables for which they are designed. Standard materials are brass bodies (chromate conversion coated for protection), PTFE resin per MIL-P-19468 insulators and anchor beads, beryllium-copper contacts, and stainless steel hardware. Connectors for HELIAX cables are produced on precision automated machinery. Extensive tooling and jig fixtures have been developed to ensure the high quality traditionally associated with Andrew products.

Quality Assurance

HELIAX coaxial cables are inspected throughout the manufacturing process to ensure published electrical and mechanical performance characteristics are maintained. This inspection process begins with raw materials, continues during manufacture, and is completed with the final packaging of the cable for shipment to the customer.

Tensile strength and conductivity of all copper strip material is tested prior to manufacture. In addition to sophisticated mechanical and electrical testing equipment, Andrew maintains a metallographic laboratory to evaluate the quality of all manufacturing processes.

Loss factors of all dielectric materials are measured prior to use. During the manufacture of foam-dielectric HELIAX cables, automated equipment monitors core size and high voltage integrity. The rugged polyethylene jacket is 100% high voltage spark tested to detect pinholes that might cause electrical or corrosion problems after installation.

Mechanical characteristics, VSWR, and impedance are tested on a statistical sampling basis. Each production length of cable is tested for pulse reflection, high voltage, leakage resistance and continuity. HELIAX air-dielectric coaxial cables are pressure checked before shipment and are shipped pressurized with dry air.

Availability

The picture above shows a portion of the HELIAX cables stocked at our Orland Park, Illinois, headquarters and manufacturing facility. In addition, popular sizes of HELIAX cables and connectors are also stocked in France and at our manufacturing facilities in Australia, Canada and the United Kingdom. With these worldwide resources, Andrew is well situated to coordinate and fulfill international communications requirements.

Shipping

HELIAX coaxial cables are shipped in boxes, cartons, or on disposable or returnable reels. When connector-fitted cable assemblies are ordered, the antenna end of the cable is wound on the outside of the coil and may be hoisted directly up the tower. Any necessary trimming of excess cable is done at the transmitter end. Factory-attached flange connectors are shipped with a blank cover to retain pressure during shipment. The cover also affords protection to the connector face and prevents entry of foreign matter.

Installation

The availability of long continuous lengths of HELIAX cable and the cable's flexibility normally allow an easy one-piece installation with connectors needed only at equipment and antenna terminations. Complete instructions are included with each shipment.

Connector Attachment

Cables can be supplied in bulk or cut to length and fitted with connectors. Connectors can be readily attached in the field with standard hand tools. Cable lengths are measured from the connector flange face or end. Standard cable cutting tolerance is +2%, –0%. Closer tolerances are available on special order.

Selection

In selecting a cable, construction is important. Braided outer conductor cables, for example, are susceptible to moisture which can significantly increase attenuation. The braid also allows RF leakage. However, the construction utilized in all HELIAX coaxial cables eliminates both moisture and RF leakage.

Foam-Dielectric Cables

HELIAX foam-dielectric coaxial cables are ideal for most antenna feeder systems which do not require a pressure path to the antenna. Typical applications include antenna systems for land mobile radio, cellular radio, terrestrial microwave, broadcast and HF communications. HELIAX foam-dielectric cables are available in sizes from 1/4" to 1-5/8". Superflexible versions are available for applications where flexibility is of primary importance.

In 1976 Andrew introduced the LDF series of improved HELIAX foam-dielectric cables. In 1982 Andrew introduced a new series (identified by the "A" suffix) of LDF cables that are even lower in loss without any change in mechanical characteristics.

All LDF series cables have the same flexibility, RF shielding and long-term reliability as previous HELIAX foam-dielectric cables, but with improved environmental and electrical performance features.

Low Loss. The low-loss foam dielectric offers attenuation performance approaching that of air-dielectric cables of similar size. Improvements in the foam dielectric for Types LDF4-50A, LDF5-50A, LDF7-50A and the new LDF6-50 result in even lower attenuation values than were previously available.

Weatherproof. Connector "O" ring seals, in conjunction with the annular corrugations in the outer conductor, provide a longitudinal moisture block. To eliminate differential expansion the dielectric is mechanically locked to the outer conductor and bonded to the inner conductor.

Self-Flaring Connectors. This patented* innovation results in simplified assembly, excellent electrical contact and high resistance to connector pull-off and twist-off. Each connector is designed for low VSWR up to the cutoff frequency of the cable.

System Design Economies. In some cases, the lower loss of LDF series cables is sufficient to permit the use of the next smaller size cable. In other cases, a foam-dielectric cable can be used instead of an air-dielectric cable of similar size, thus eliminating the need for pressurization.

Air-Dielectric Cable

HELIAX air-dielectric coaxial cables are ideal for antenna feeder systems which require a pressure path to the antenna. Compared with foam-dielectric cables, attenuation is lower and power handling capability is higher. Typical applications include high power broadcast transmitting antenna systems, terrestrial microwave systems, earth station antenna systems and HF communication systems. HELIAX air-dielectric cables are available in sizes from 1/2" to 5".

Average Power. Air-dielectric HELIAX coaxial cables and connectors are specifically designed to provide reliable performance when subjected to continuous operation at high power. All power ratings take into account the operation of both cable and associated connectors. These power ratings have been verified by field testing under RF power.

Andrew average power ratings are based on a VSWR of 1.0, atmospheric pressure and ambient temperature of 40°C (104°F). Power ratings specified take into consideration the accelerated aging of the dielectric due to the rise in temperature of the inner conductor. Once a rating is determined for the conditions stipulated, it can be adjusted to meet the actual usage conditions.

There are two standard power ratings for air-dielectric cables. Condition A is recommended for installations in extreme climates where there may be continuous exposure to high ambient temperatures. Condition B is recommended for installations in more moderate climates where exposure to high ambient temperatures and the resulting, somewhat higher, inner conductor temperatures exist for limited time periods. For recommendations for a particular location, and for installations which

*Patented United States 4,046,451 and pending in other countries.

Cutaway View of Typical Connector Construction

may substantially affect the operating temperature of the cable (such as burial or laying in ducts), contact your local Andrew Sales Office listed inside the back cover.

Cable Construction. The dielectric materials used in HELIAX are proprietary formulations which include suitable anti-oxidants to minimize dielectric deterioration at high temperatures. The shape of the dielectric itself has been designed to provide for thermal conduction of heat away from the inner conductor. All HELIAX cables are supplied with a black polyethylene jacket for abrasion resistance. The jacket offers excellent mechanical protection both during and after installation. Options include unjacketed versions and jacketed versions that are fire retardant or fire retardant, non-halogenated.

Average power ratings for HELIAX air-dielectric coaxial cables are based on an ambient temperature of 40°C (104°F). The polyethylene dielectric used in 1/2", 7/8", 1-5/8" and 5" HELIAX sizes is rated for continuous operation at an inner conductor temperature of 100°C (212°F). The 3" and 4" HELIAX cables employ a special, high-temperature polyolefin dielectric which allows these cables to be rated at an inner conductor temperature of 121°C (250°F). Special high temperature HELIAX cables are available in 1/2" and 7/8" sizes, and employ a dielectric made of Teflon*. Average power rating is based on an inner conductor temperature of 200°C (392°F). These ratings result in cable operating temperatures substantially below the softening points of the dielectric materials used. Although cables can be operated close to the softening point of the dielectric materials, this is not recommended for continuous operation since deterioration of the dielectric could result.

Connectors. All HELIAX connectors are designed to be compatible with the performance requirements of the cable. Rough edges and sharp corners are eliminated in the connector to prevent corona problems. "O" rings used in the RF field are of a material which is not susceptible to RF deterioration. A tab-flare approach is used for the outer conductor electrical contact in all sizes as well as for the inner conductor in the larger sizes. The tab-flare has proven itself in thousands of applications and can readily be formed using simple hand tools. Since the tab-flare simply bends the material, it allows the high mating pressures and thickness uniformity needed for proper electrical contact. This results in a reliable and trouble-free connector attachment.

*Trademark of DuPont.

Ordering Information

HELIAX cables are available cut to length either with connectors fitted at one or both ends or with connectors unfitted. When ordering, specify the cable type number, length in feet or metres, connector type numbers and "fitted" or "unfitted." It is also necessary to specify the operating frequency band for microwave cables (described on pages 240 and 242), low VSWR cables (pages 248 and 249) and broadcast cables (page 245).

When fitted connectors on an assembly are different, specify which is "first off" the reel.

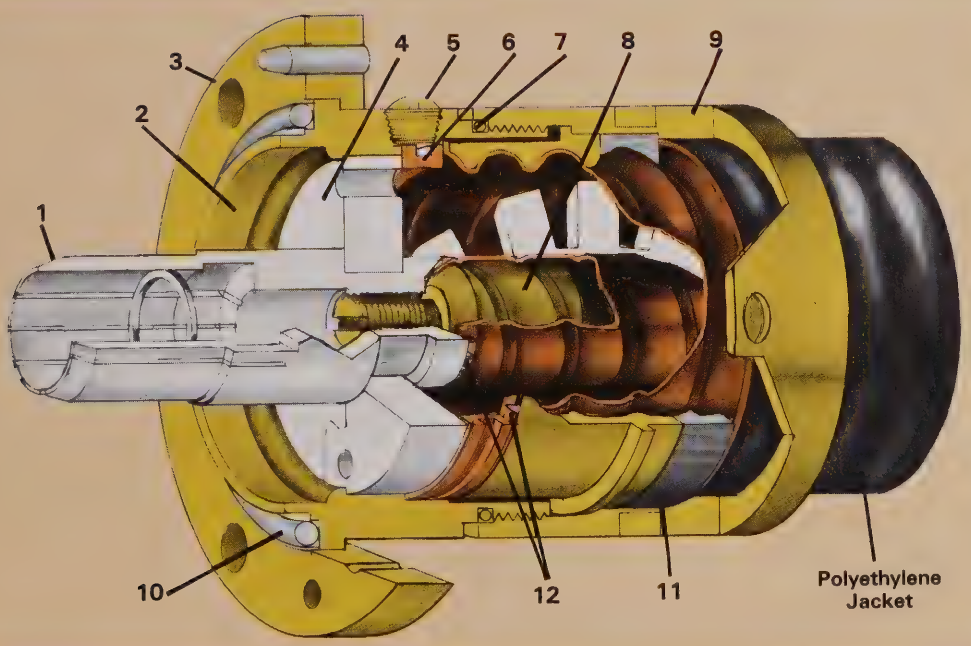
Example of Assembly

Type No.	Description	Qty.
LDF5-50A	HELIAX Coaxial Cable	350 ft
L45W	Connector, fitted, first off	1
L45N	Connector, fitted	1

Example of Unfitted Length

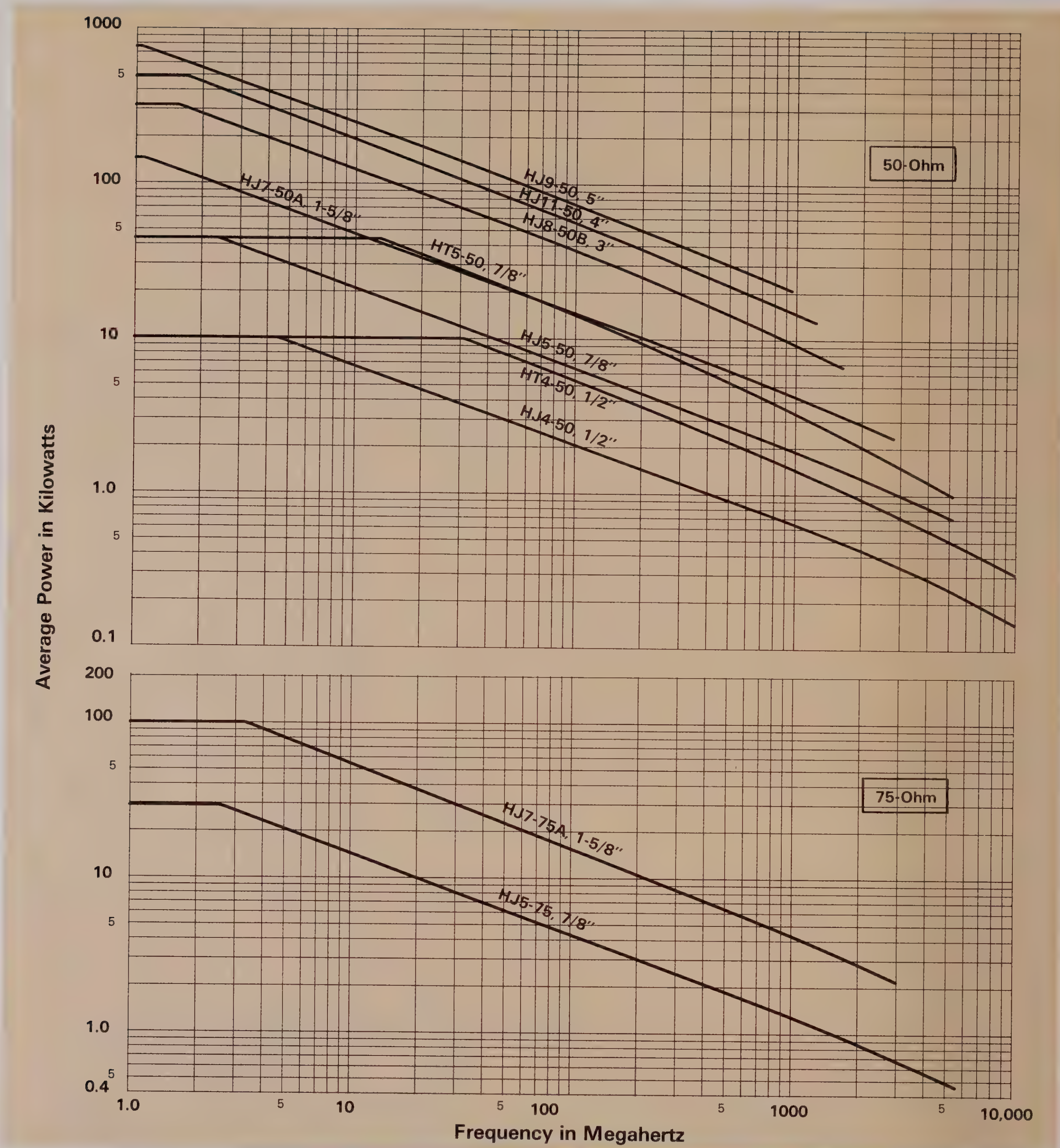
Type No.	Description	Qty.
LDF5-50A	HELIAX Coaxial Cable	1400 ft
L45W	Connectors, unfitted	8

Cross Sectional View
Type 78ARM Connector Attached to Type HJ8-50B 3" Air-Dielectric HELIAX Coaxial Cable



1. Inner Conductor
2. Outer Body
3. Sliding Ring
4. Bead
5. Pipe Plug
6. Flare Ring
7. "O" Ring
8. Inner Stub
9. Clamping Nut
10. "O" Ring
11. Gasket
12. Tab Flare

Air-Dielectric Power Rating, Condition A – Extreme Climates

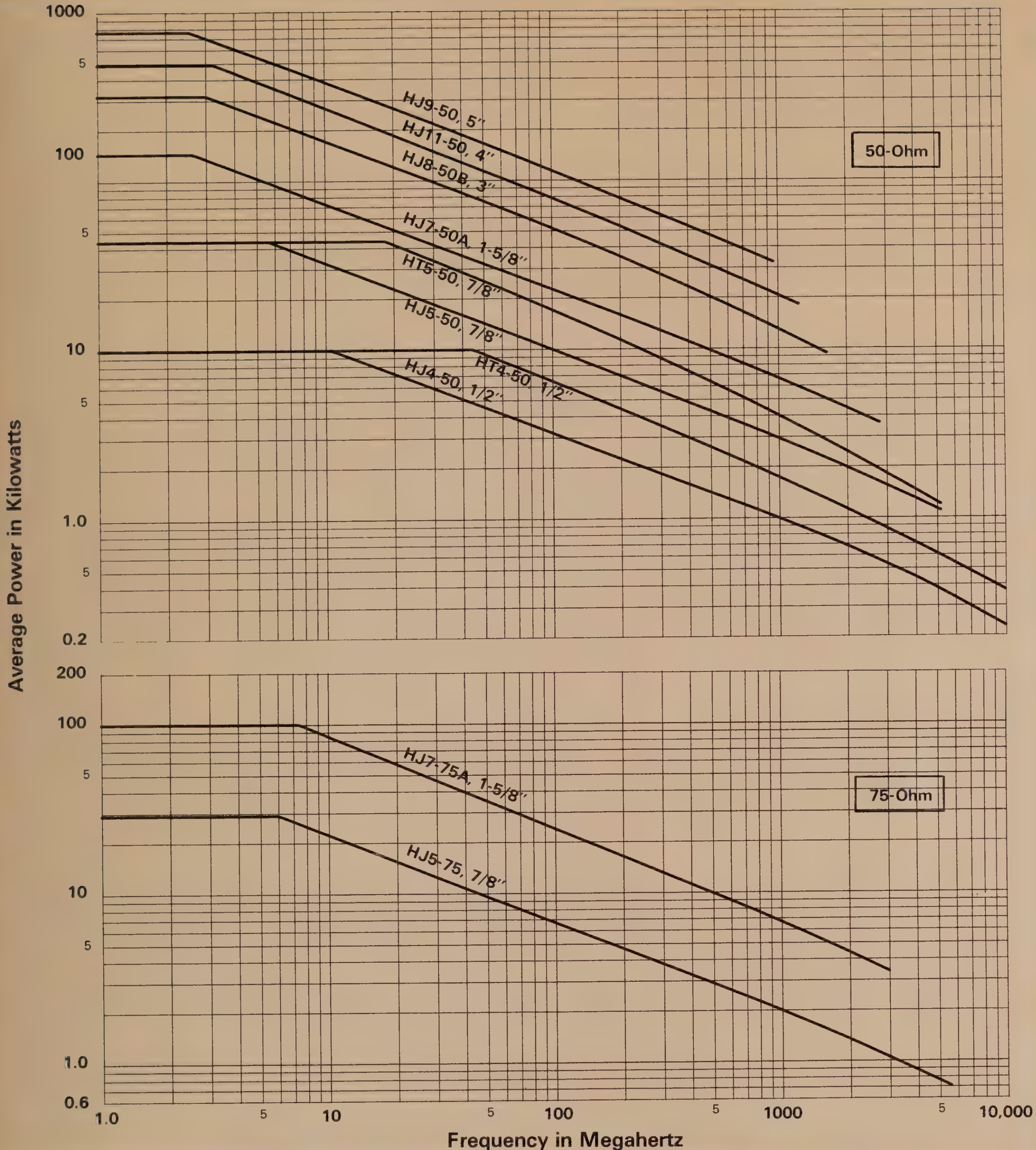


Condition A

Power Ratings Based on	1.0 VSWR
Ambient Temperature	40°C (104°F)
Atmospheric Pressure	Dry air
Inner Conductor Temperatures	
HJ9, HJ7, HJ5, HJ4	100°C (212°F)
HJ11, HJ8	121°C (250°F)
HT4, HT5	200°C (392°F)
Conversion Data:	

For other ambient temperatures, see page 220
For pressurized lines, see page 220

There are two standard power ratings for air dielectric cables. Condition A is recommended for installations in extreme climates where there may be continuous exposure to high ambient temperatures. Condition B is recommended for installations in more moderate climates where exposure to high ambient temperatures is of limited



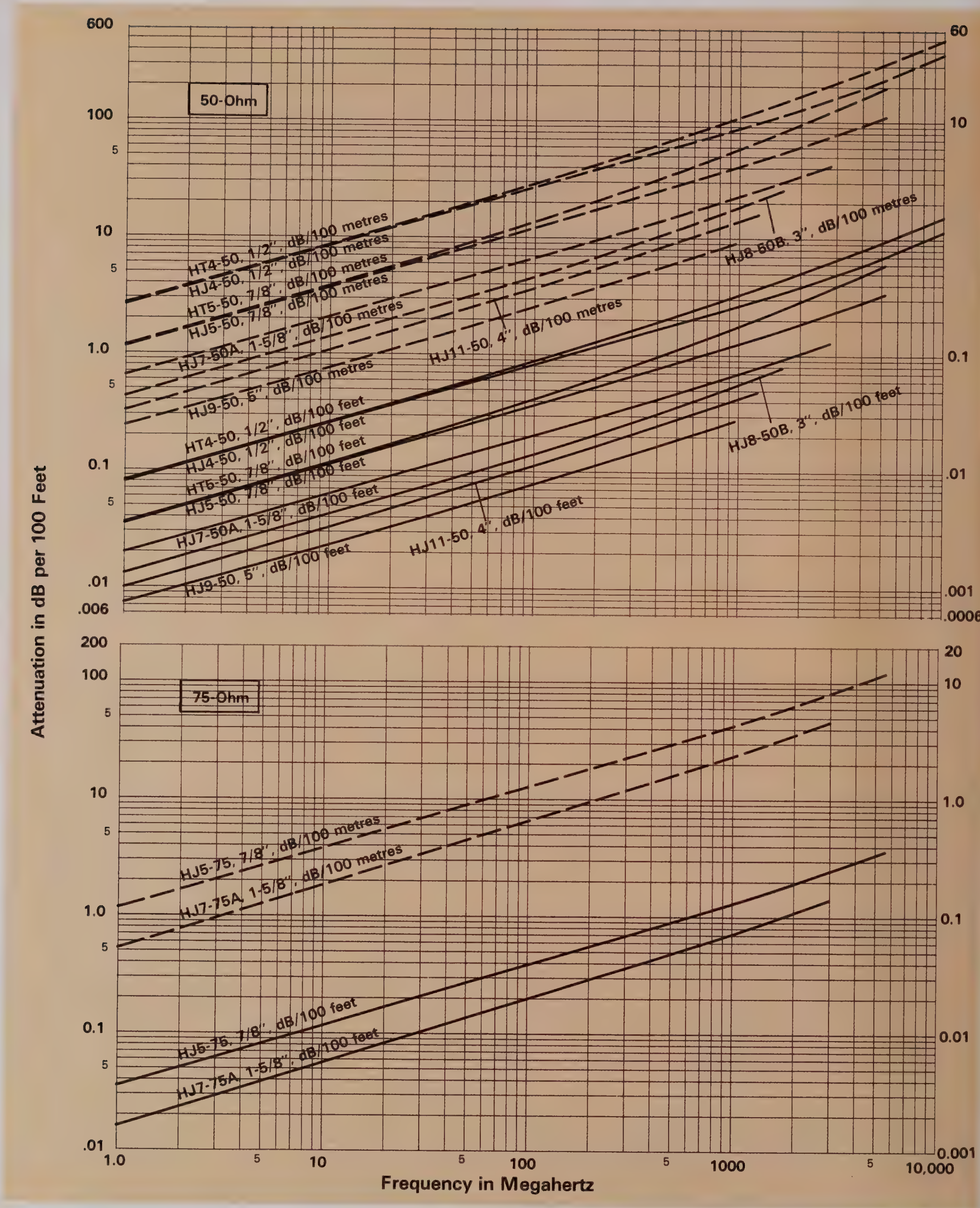
duration. For recommendations for a particular location, and for installations which may substantially affect the operating temperature of the cable (such as burial or laying in ducts), contact your local Andrew Sales Office listed on the inside back cover.

Condition B

Power Ratings Based on	1.0 VSWR
Ambient Temperature*	30°C (86°F)
Atmospheric Pressure	Dry air
Inner Conductor Temperatures	
HJ9, HJ7, HJ5, HJ4	100°C (212°F)
HJ11, HJ8	121°C (250°F)
HT4, HT5	200°C (392°F)
Conversion Data:	

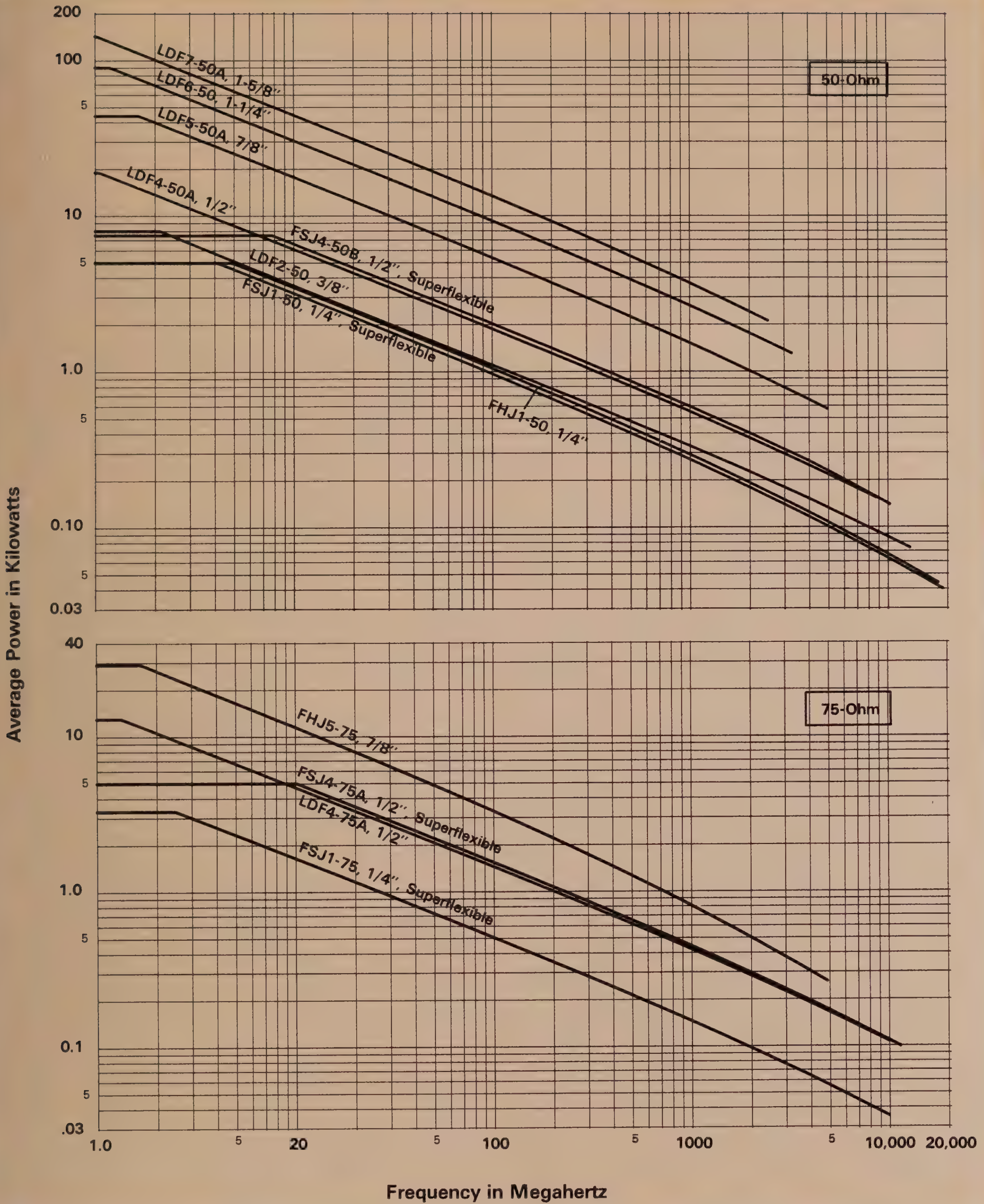
For other ambient temperatures, see page 220
For pressurized lines, see page 220

*Limited duration exposure



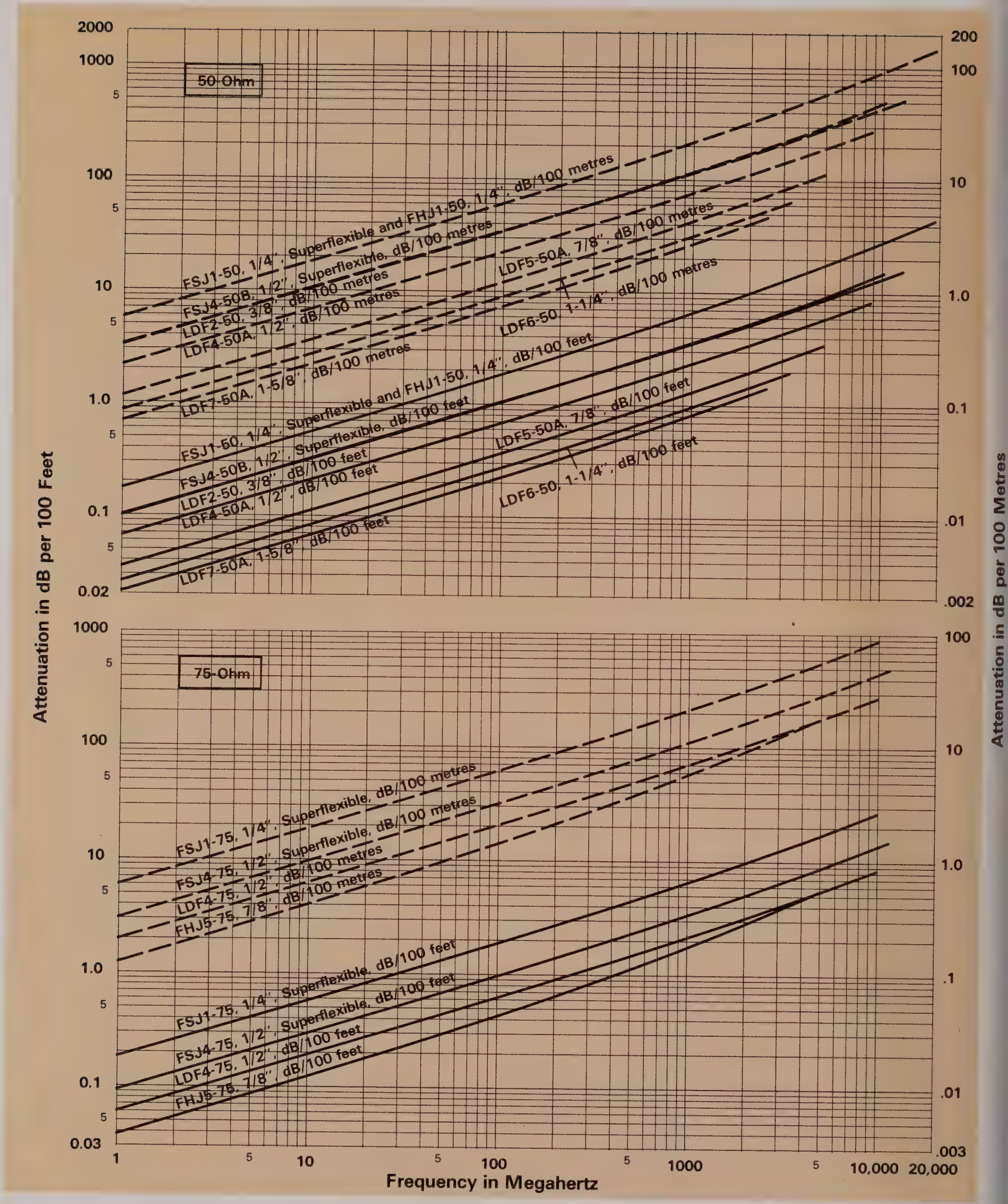
Attenuation Curves based on:
VSWR 1.0
Ambient Temperature 24°C (75°F)
Atmospheric Pressure, dry air

Conversion Data:
For other ambient temperatures, see curve on page 219.



Power Ratings based on:
VSWR 1.0
Ambient Temperature 40°C (104°F)
Inner Conductor Temperature 100°C (212°F)

Conversion Data:
For other ambient temperatures, see curve on page 220.



Attenuation Curves based on:
VSWR 1.0
Ambient Temperature 24°C (75°F)
Atmospheric Pressure, dry air

Conversion Data:
For other ambient temperatures, see curve on page 219.

Figure 1 – Variation of Attenuation with Ambient Temperature

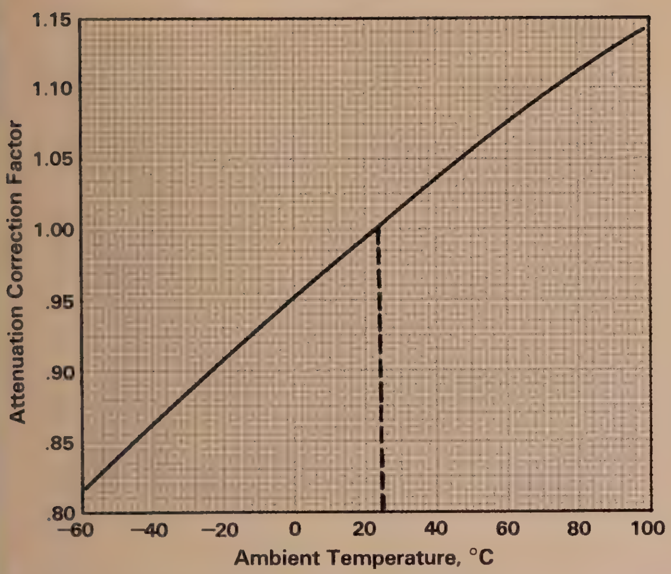
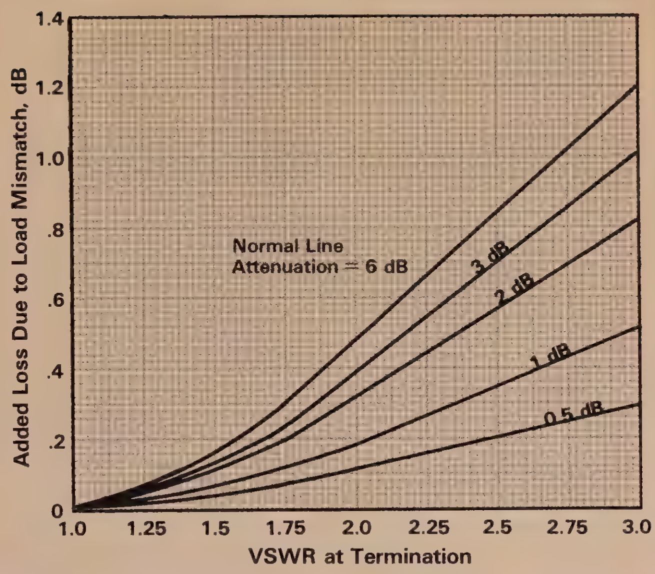


Figure 2 – Effect of Load VSWR on Transmission Loss



Attenuation

Pages 216 and 218 show nominal attenuation versus frequency characteristics of HELIAX coaxial cables. The values shown are for 24°C (75°F) ambient and increase slightly with higher temperature or applied power, up to approximately 13% above the curves at full average-power rating. Figure 1 shows this relationship.

Load VSWR Effect on Total Transmission Loss

When the transmission line is attached to a load, such as an antenna, the VSWR of the load increases the total transmission loss of the system. This effect is quite small for normal conditions. Figure 2 shows the minimum increase in loss with load VSWR, assuming a VSWR of 1.0 at the input of the transmission line. This requires use of an input matching device.

Power Rating Considerations

Both peak- and average-power ratings are required to fully describe the capabilities of a given transmission line. Typically, peak-power ratings limit the amplitude modulation or pulsed usage while average-power ratings limit the high frequency usage.

Peak-Power Rating

The peak-power rating of a transmission line is limited by voltage breakdown between the inner and outer conductors.

Voltage breakdown is independent of frequency, but varies with line pressure and type of pressurizing gas. Peak-power ratings are, therefore, generally stated for the following standard conditions: VSWR = 1.0, zero modulation, and one atmosphere absolute dry air pressure (0 lb/in^2 or 0 kPa gauge) at sea level.

The peak-power rating of the selected cable must be greater than the following expression in addition to satisfying the average power handling criteria:

$$P_{PK} > P_T \,(1 + M)^2 \text{ VSWR}$$

where
P_{PK} = Cable Peak-Power Rating (kW)
P_T = Transmitter Power (kW)
M = Amplitude Modulation percentage expressed decimally (100% = 1.0)
VSWR = Voltage Standing Wave Radio

From this relation it can be seen that 100% amplitude modulation increases the peak-power in the transmission line by a factor of 4. Also, the peak power in the transmission line increases directly with VSWR.

The transmission line peak-power rating can be significantly increased by pressurization. See page 220 for details.

An adequate safety factor on peak power is necessary to safeguard against voltage breakdown, which can result in permanent damage to the transmission line. All Andrew HELIAX coaxial cables are high-voltage tested to the equivalent of 400% of their rated peak power (safety factor of 2 on voltage) before shipment to the customer. This safety factor is intended as a provision for transmitter transients, lightning induced transients, and high voltage excursions due to other unforeseen causes. Andrew's use of a safety factor of 4 on published peak-power ratings has resulted in reliable service in thousands of installations over the past 40 years.

FIGURE 3 – Pressurization Factors

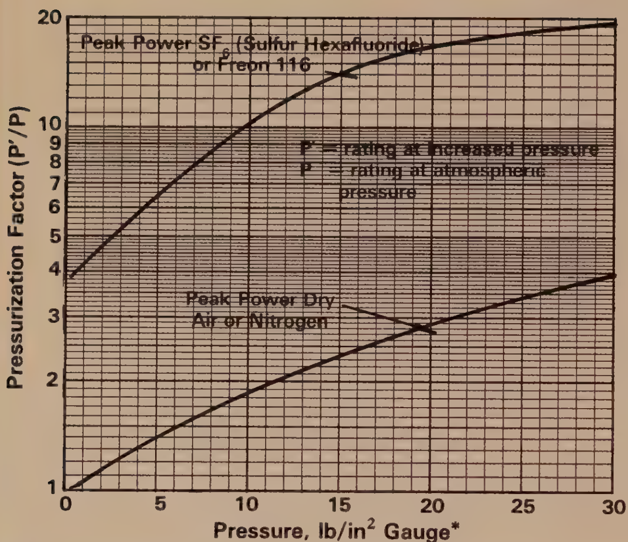
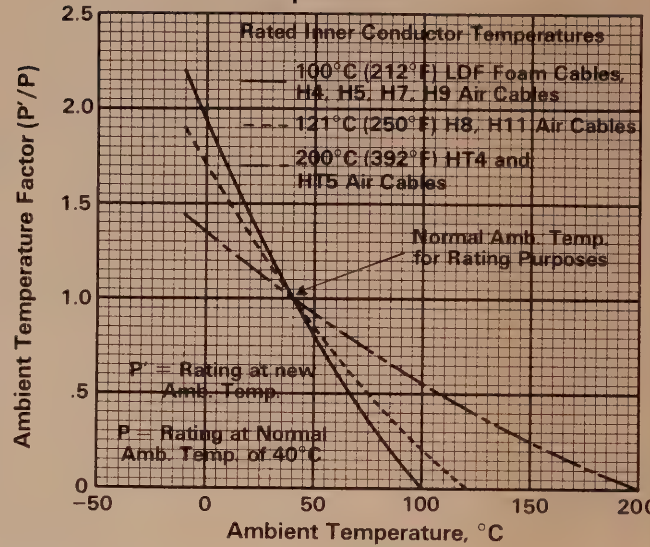


Figure 4 – Variation of Average Power Rating with Ambient Temperature



Voltage breakdown will occur at approximately the same values for similarly sized air-dielectric cables. Therefore, significantly higher peak-power ratings for similarly sized cables advertised by some other cable manufacturers are clearly the result of operating with a lower safety factor. The transmission line specifier is cautioned accordingly.

HELIAX peak-power ratings are determined according to the relation:

$$P_{PK} = \frac{\left(\dfrac{E_p \times 0.707 \times 0.7}{2}\right)^2}{Z_O}$$

where P_{PK} = Cable Peak Power Rating, Standard Conditions
E_P = DC production Test Voltage
0.707 = RMS factor
0.7 = DC to RF factor (empirically verified)
2 = Safety Factor on Voltage
Z_O = Characteristic Impedance

Typical DC production test voltages for common sizes of air-dielectric cables are shown below:

Nominal Size	7/8"	1-5/8"	3"	3-1/8"	4"	5"
Ep, kV	6	11	16	19	20	25

Foam-dielectric cables have a greater dielectric strength than air-dielectric cables of similar size and for this reason might be expected to have higher peak-power ratings than air cables. Higher peak-power ratings usually cannot be realized, however, because the commonly used connectors for foam cables have air spaces at the cable/connector interface which limit the allowable RF voltage to "air cable" values. Andrew rates similar size foam-and air-dielectric cables alike for this reason. Specially-designed connectors are needed to utilize foam cable up to the breakdown voltage of the foam. For details on these connectors, contact your local Andrew Sales Office listed on the inside back cover.

Increased Peak Power Ratings

Pressurization and/or the use of high-density gases with high dielectric strength can be used to increase peak-power ratings. These effects are shown in Figure 3.

For a given transmission line pressure, the increase in peak-power rating is significant. For example, a line pressure of 10 lb/in² (70 kPa) dry air increases the peak-power rating by a factor of 1.9. Pressurization above 30 lb/in² (207 kPa) is not recommended.

Average Power Rating

Average-power ratings of transmission lines are governed by the safe long-term operating temperature of the dielectric. The maximum permissible inner conductor temperature varies with the type of dielectric and is based upon consideration of the long term life of the dielectric.

*For kPa, multiply by 6.895.

Figure 5 — Derating Factor for Average Power Due to VSWR

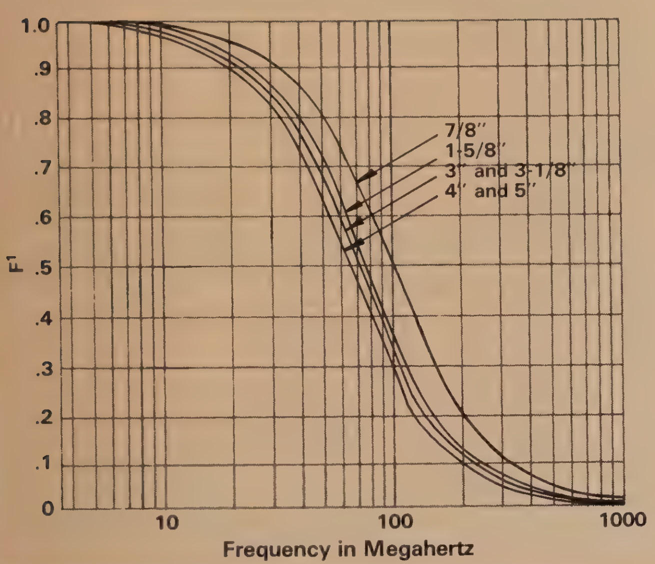
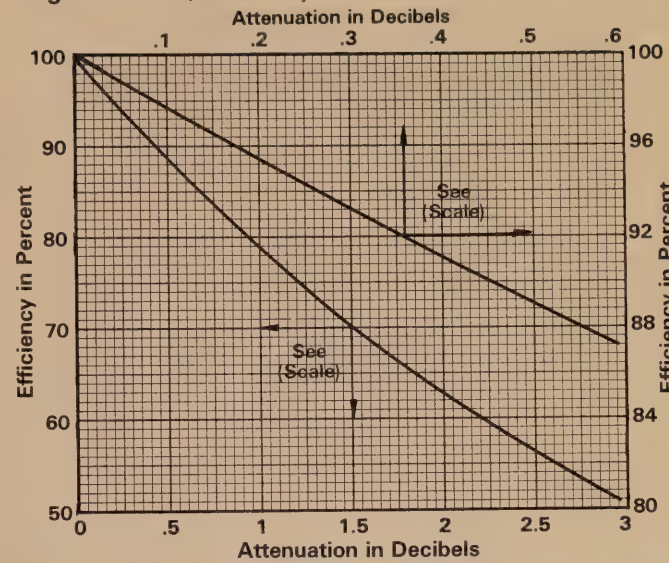


Figure 6 — dB/Efficiency Conversion Chart



Andrew average power ratings are based on a VSWR of 1.0 and an atmospheric pressure and ambient temperature of 40°C (104°F).

There are two standard power ratings for air-dielectric cables. Condition A is recommended for installations in extreme climates where there may be continuous exposure to high ambient temperatures. Condition B is recommended for installations in more moderate climates where exposure to high ambient temperatures is of limited duration. For recommendations for a particular location, and for installations which may substantially affect the operating temperature of the cable (such as burial or laying in ducts), contact your local Andrew Sales Office listed on the inside back cover.

Average Power Rating Adjustment for Ambient Temperature

Once a rating is determined for the conditions stipulated, it can be adjusted to meet the actual usage conditions. Figure 4 shows the variation of average power rating with ambient temperature. To convert rated transmitter power to average power for television transmission, multiply by 0.83. For AM or FM radio, the factor is 1.0.

Derating Average Power for VSWR

The derating factor (D.F.) is calculated from the following formula:

$$\text{D.F.} = \frac{2(\text{VSWR}^2 + 1) + 2F^1\ (\text{VSWR}^2 - 1)}{(\text{VSWR} + 1)^2}$$

where F^1 is a factor that varies with frequency and line size. Select the factor from the applicable curve in Figure 5, calculate factor D.F., and divide into the average power read off the appropriate graph.

For example: Calculate power rating for 3" HJ8-50B cable operating at 100 MHz with VSWR = 1.1, F^1 (from Figure 5) = 0.33:

$$\text{D.F.} = \frac{2\ (1.1^2 + 1) + 2 \text{ x } 0.33\ (1.1^2 - 1)}{(1.1 + 1)^2} = 1.034$$

Average Power Rating at 1.00 VSWR = 37 kW

Average Power Rating at 1.1 VSWR = 37/1.034 = 35.8 kW

Efficiency

The efficiency of a transmission line depends on its length and attenuation. The efficiency is defined as the percent of transmitter power which reaches the antenna. It can be calculated as:

$$\text{Efficiency} = \frac{100\ \%}{10^{\left(\frac{db}{10}\right)}}$$

where dB is the total attenuation of the transmission line at the frequency of interest.

The remaining power is lost in the transmission line and is dissipated as heat. Figure 6 illustrates a convenient method for determining transmission line efficiency.

1/4" Foam-Dielectric and Superflexible

Superflexible HELIAX cables are ideal for applications such as earth station antenna interconnections, land mobile radio jumpers, and military phase-stabilized and electronic warfare applications. The flexible solid-sheath outer conductor provides superior shielding characteristics compared with braided cable. A small bending radius and 100% RF shielding also make them ideal for use in combiner interconnections.

FHJ1-50 cable is a popular choice for AM radio sampling lines and for use as feeders in military phase-stabilized and electronic warfare applications.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

FHJ1-50, 1/4"

FSJ1-50, 1/4"

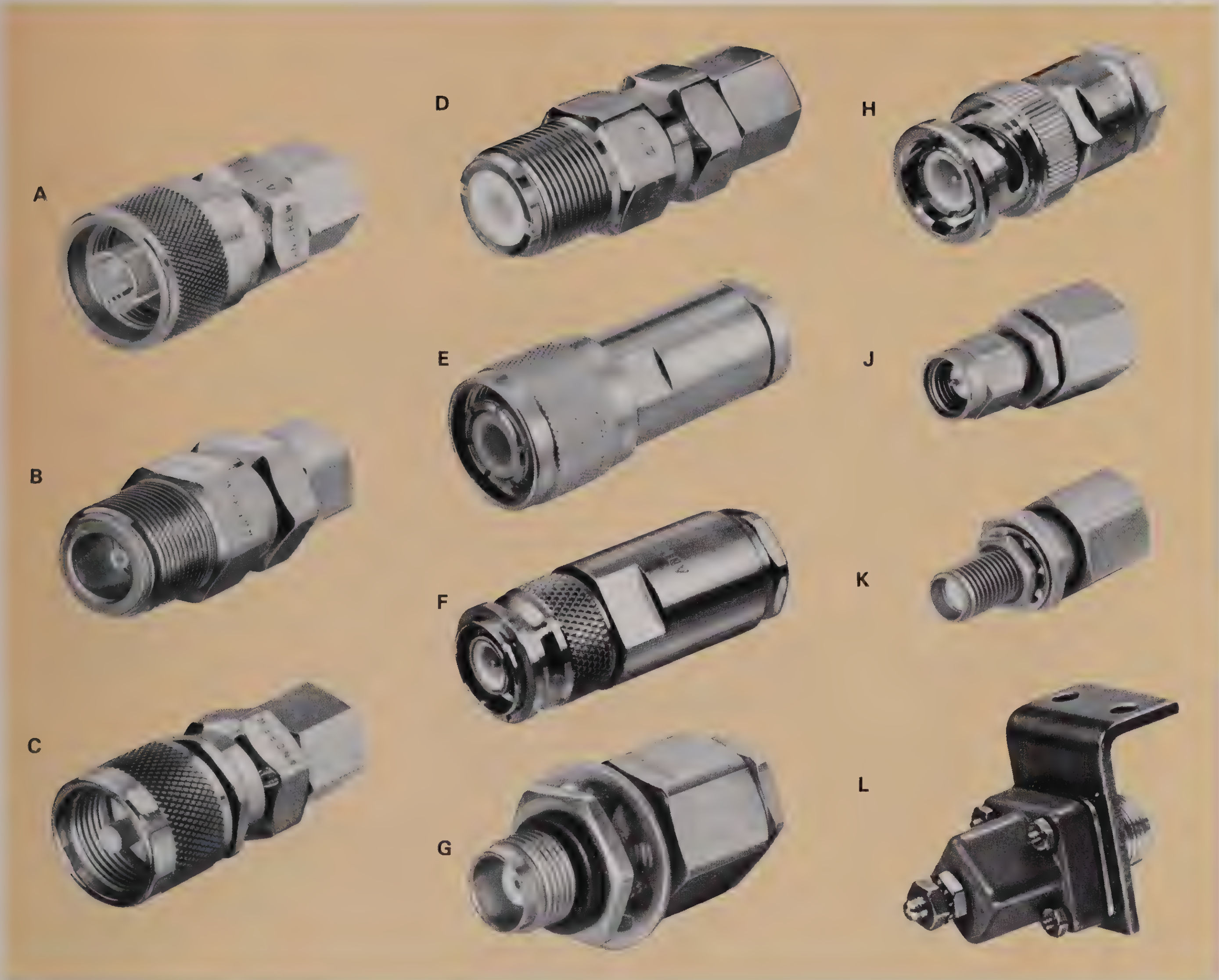
FSJ1-75, 1/4"

Characteristics

Nominal Size Impedance, ohms	1/4" 50	1/4" Superflexible 50	1/4" Superflexible 75
Cable Type Numbers			
Standard Cable, Standard Jacket	**FHJ1-50**	**FSJ1-50**	**FSJ1-75**
Standard Cable, Fire-Retardant Jacket	**41690-22**	**41690-21**	**41690-18**
Specially Selected and Tested Cables		(See referenced pages for details)	
Earth Station 10.95-12.2 GHz	—	48659-10 (244)	—
Low VSWR Assemblies, 0.3-18 GHz (see page)	(249)	(249)	—
Standard Jumper Assemblies (see page)	—	(248)	—
AM Radio Sampling Lines (see page)	35422-11 (246)	—	—
Electrical Characteristics			
Maximum Frequency, GHz	18	19	24.4
Velocity, percent	79	78	78
Peak Power Rating, kW	5	5	3.3
Attenuation*, dB/100 ft (dB/100 m)			
1 MHz	0.163 (0.534)	0.175 (0.574)	0.182 (0.597)
10 MHz	0.523 (1.71)	0.561 (1.84)	0.574 (1.88)
100 MHz	1.73 (5.67)	1.85 (6.06)	1.87 (6.14)
1000 MHz	6.21 (20.4)	6.59 (21.6)	6.50 (21.3)
2000 MHz	9.42 (30.9)	9.97 (32.7)	9.70 (31.8)
Average Power Rating**, kW			
1 MHz	5.0	5.0	3.3
10 MHz	3.47	3.42	1.6
100 MHz	1.05	1.04	0.49
1000 MHz	0.292	0.291	0.142
2000 MHz	0.192	0.193	0.095
Mechanical Characteristics			
Outer Conductor	Copper	Copper	Copper
Diameter over Jacket, in (mm)	0.29 (7.4)	0.30 (7.6)	0.30 (7.6)
Minimum Bending Radius, in (mm)	2.5 (63)	1 (25)	1 (25)
Cable Weight, lb/ft (kg/m)	.057 (.085)	.055 (.082)	.046 (.068)

*For other frequencies and definition of standard conditions, see page 218.

**For other frequencies and definition of standard conditions, see page 217.



Connector Type Numbers

	Interface	For 1/4" FHJ1-50	For 1/4" FSJ1-50	For 1/4" FSJ1-75
A	N Plug (male), mates with UG-23	41W	41SW	41SW
A	N Plug (male), mates with UG-23, low VSWR	41EW†	41SEW†	—
A	N Plug (male), mates with UG-95, 70-ohm mating pin	—	—	41SW-70
B	N Jack (female), mates with UG-21	41N	—	—
B	N Jack (female), mates with UG-21, low VSWR	41EN†	—	—
B	N Jack (female), mates with UG-94, 70-ohm mating pin	—	—	41SN-70
C	UHF Plug (male), mates with SO-239A	41P	41SP	41SP
D	UHF Jack (female), mates with PL-259A	41U	—	—
E	HN Plug (male), mates with UG-60	—	41SJ	—
F	TNC Plug (male), mates with TNC female, 50-ohm mating pin	41EWT†	41SWT	41SWT-75
G	TNC Jack (female bulkhead), mates with TNC male	41ENT†	—	—
H	BNC Plug (male), mates with UG-89	—	40622	—
J	SMA Plug (male), mates with SMA Jack	41EWS†	41SWS	—
K	SMA Jack (female bulkhead), mates with SMA Plug	41ENS†	41SNS	—
L	End Terminal Adaptor, mates with N Plug	13074A	—	—

† Connector for low-VSWR applications. Includes gold-plated inner conductor.

For dimensions and weights, see page 250. For RF connector adaptors, see page 251. For rigid line components, see pages 262-271.

HELIAX® Coaxial Cable
3/8" Foam-Dielectric and 1/2" Superflexible

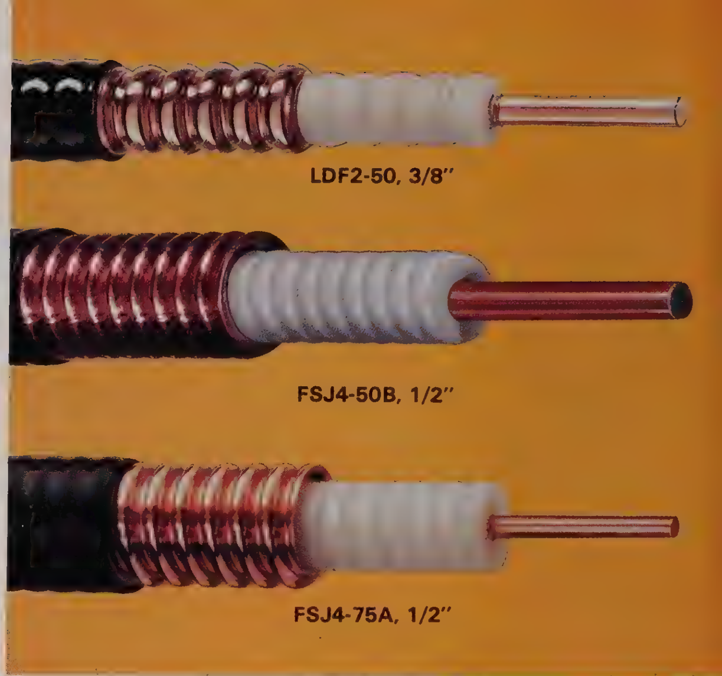
These low-loss HELIAX foam-dielectric cables provide a combination of strength, flexibility and efficiency not available in other cables. Applications include land mobile base station antenna feeders, AM antenna arrays, CCTV security systems, CATV, earth station antenna IF systems and military data links. Extremely low phase-temperature coefficients make these cables ideal for phase-stabilized cable assemblies used in applications such as phased array radar and broadcast sampling lines. In addition, the superflexible cables are ideal for interconnecting combiners and radio equipment.

Fire retardant jacketed versions are listed by Underwriter's Laboratories, Inc.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.



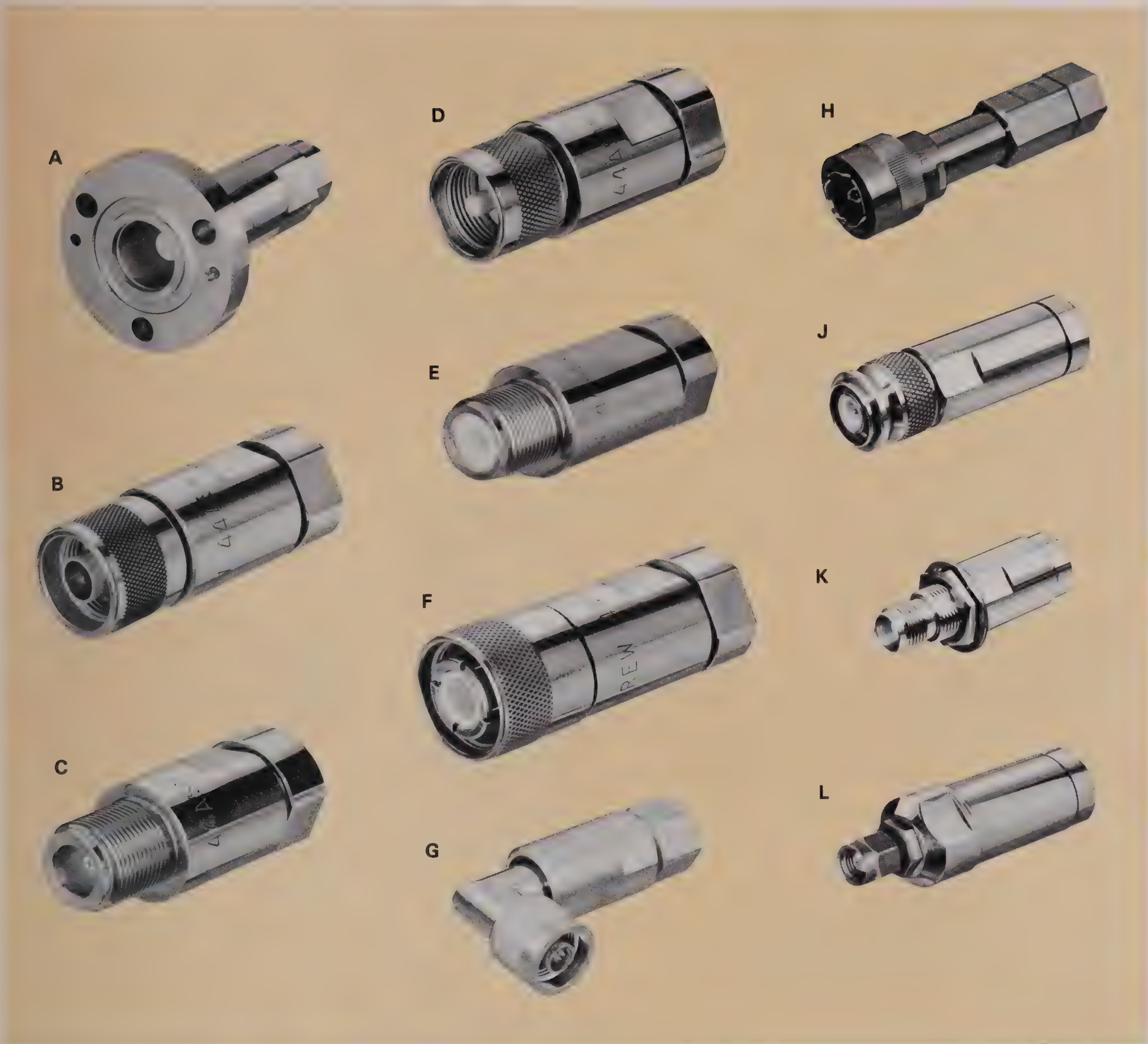
For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

Characteristics

Nominal Size Impedance, ohms	3/8" 50	1/2" Superflexible 50	1/2" Superflexible 75
Cable Type Numbers			
Standard Cable, Standard Jacket	**LDF2-50**	**FSJ4-50B**	**FSJ4-75A**
Standard Cable, Fire-Retardant Jacket	**41690-43**	**41690-24**	**41690-44**
Specially Selected and Tested Cables		(See referenced pages for details)	
Earth Station, 0.94-1.45 GHz	—	47869A-1 (244)	—
3.625-4.2 GHz	—	47869A-11 (244)	—
5.85-6.425 GHz	49774-2 (244)	47869A-12 (244)	—
10.95-12.75 GHz	49774-3 (244)	—	—
Cellular Radio, 824-894 MHz	—	(247)	—
Low VSWR Assemblies, 0.3-8 GHz	—	(249)	—
1.7-12.75 GHz	(249)	—	—
Low VSWR Jumper Assemblies, Microwave	—	(248)	—
Standard Jumper Assemblies (see page)	—	(248)	—
AM Radio Sampling Lines (see page)	35422-22 (246)	—	—
Electrical Characteristics			
Maximum Frequency, GHz	13	10.2	11.5
Velocity, percent	88	81	81
Peak Power Rating, kW	8	7.5	5.0
Attenuation*, dB/100 ft (dB/100 m)			
1 MHz	0.10 (0.33)	0.10 (0.33)	0.09 (0.30)
10 MHz	0.33 (1.08)	0.32 (1.08)	0.30 (0.97)
100 MHz	1.05 (3.44)	1.05 (3.44)	0.97 (3.17)
1000 MHz	3.5 (11.5)	3.6 (11.7)	3.4 (11.0)
2000 MHz	5.1 (16.7)	5.3 (17.4)	5.0 (16.5)
Average Power Rating**, kW			
1 MHz	8	7.5	5.0
10 MHz	3.6	6.6	5.0
100 MHz	1.1	2.0	1.54
1000 MHz	0.33	0.59	0.44
2000 MHz	0.22	0.40	0.30
Mechanical Characteristics			
Outer Conductor	Copper	Copper	Copper
Diameter over Jacket, in (mm)	0.44 (11)	0.52 (13.2)	0.52 (13.2)
Minimum Bending Radius, in (mm)	3.75 (95)	1.25 (32)	1.25 (32)
Cable Weight, lb/ft (kg/m)	0.08 (0.12)	0.14 (0.21)	0.14 (0.21)

*For other frequencies and definition of standard conditions, see page 218.

**For other frequencies and definition of standard conditions, see page 217.



Connector Type Numbers

	Interface	For 3/8" LDF2-50	For 1/2" FSJ4-50B	For 1/2" FSJ4-75A
A	7/8" EIA Flange, no gas barrier at interface	—	44ASR	—
B	N Plug (male), mates with UG-23, 50-ohm mating pin	L42W	44ASW	44ASW-75
C	N Jack (female), mates with UG-21, 50-ohm mating pin	L42N	44ASN	44ASN-75
D	UHF Plug (male), mates with SO-239A	L42P	44ASP	44ASP-75
E	UHF Jack (female), mates with PL-259A	L42U	44ASU	44ASU-75
F	HN Plug (male), mates with UG-60	—	44ASJ	—
G	Right Angle N Plug (male), mates with UG-23, 50-ohm mating pin	—	49600	49600-75
H	GR Adaptor (locking) mates with locking or non-locking GR874	—	44ASGR	—
J	TNC Plug (male), mates with TNC female	L42WT	—	—
K	TNC Jack (female bulkhead), mates with TNC male	L42NT	—	—
L	SMA Plug (male), mates with SMA Jack	120810-1	—	—

For dimensions and weights, see page 250. For RF connector adaptors, see page 251.
For rigid line components, see pages 262-271.

HELIAX® Coaxial Cable
1/2" Foam-Dielectric and Superflexible

These low-loss HELIAX foam-dielectric cables provide a combination of strength and efficiency not available in other cables. Applications for these cables include land mobile base station antenna feeders, AM antenna arrays, CCTV security systems, CATV, IF earth station antenna systems and military data links. Extremely low phase-temperature coefficients make these cables ideal for phased-stabilized cable assemblies used in applications such as phased array radars and broadcast sampling lines.

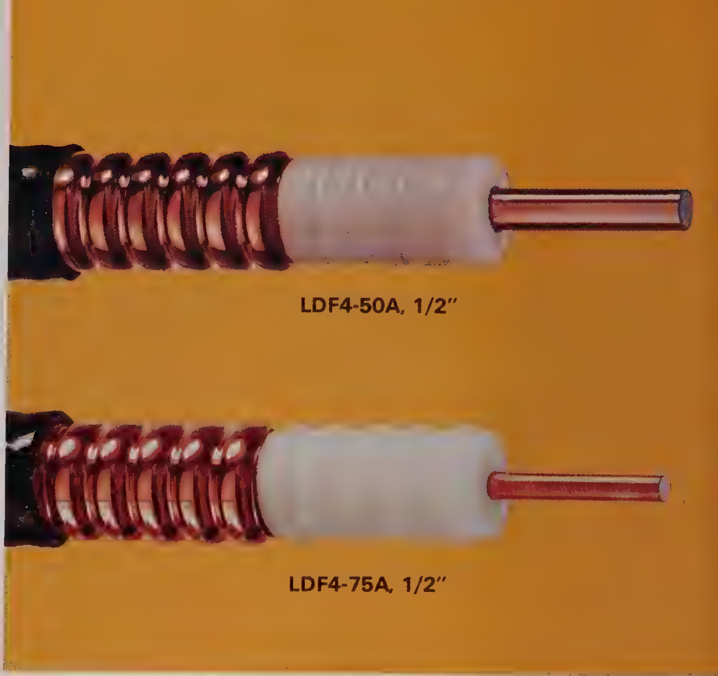
Fire-retardant jacketed versions are listed by Underwriter's Laboratories, Inc.

For military applications, a version of LDF4-50A, which has been qualified to MIL-C-28830, is available.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 251-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.



LDF4-50A, 1/2"

LDF4-75A, 1/2"

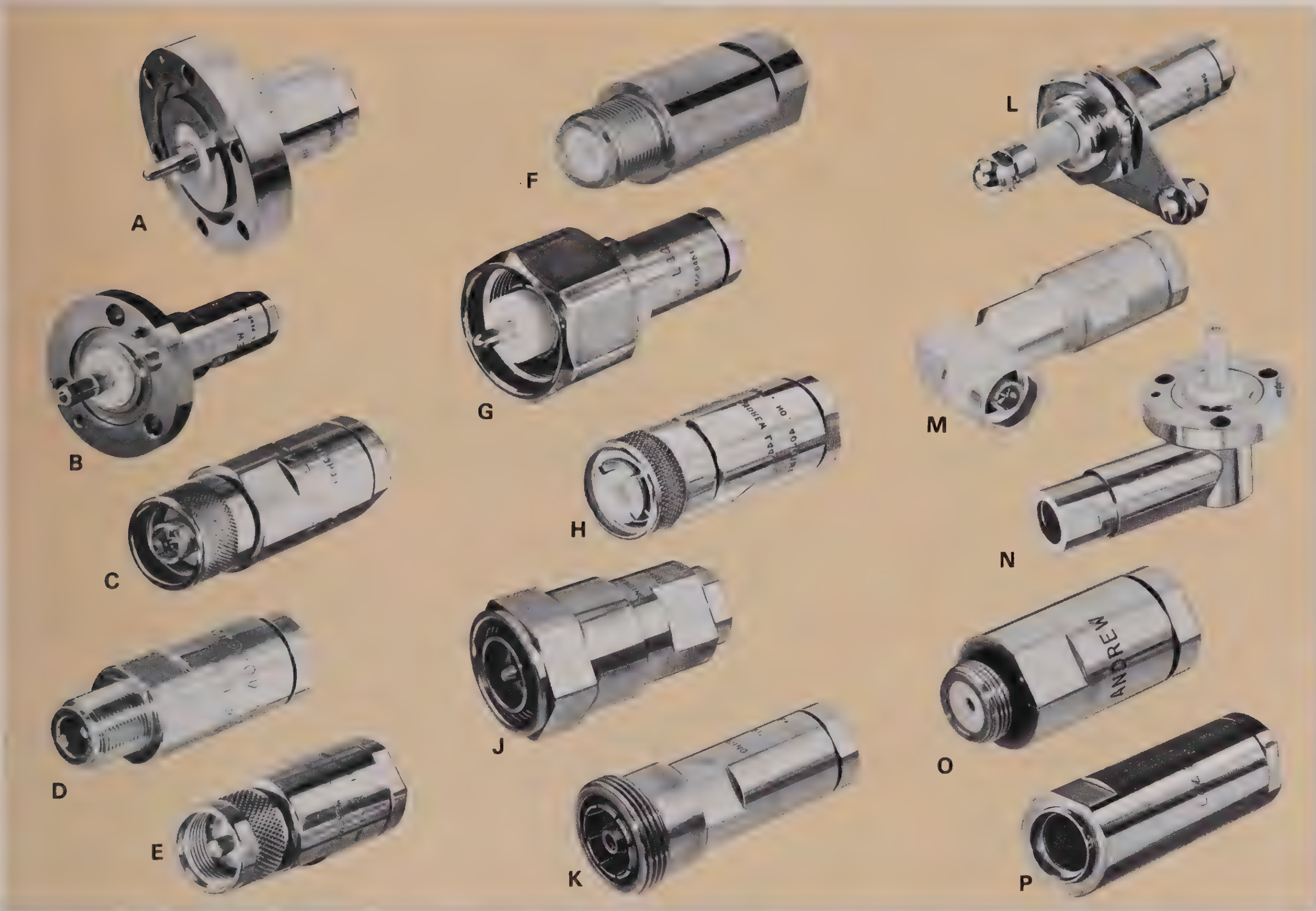
For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

Characteristics

Nominal Size Impedance, ohms	1/2" 50	1/2" 75
Cable Type Numbers		
Standard Cable, Standard Jacket	**LDF4-50A**	**LDF4-75A**
Standard Cable, Fire-Retardant Jacket	**41690-8**	**41690-17**
Specially Selected and Tested Cables	(See referenced pages for details)	
Microwave, 1427-2700 MHz	LDF4P-50A (240)	—
Earth Station, 0.94-1.45 GHz	43818-42 (244)	—
3.625-4.2 GHz	43818-5 (244)	—
5.85-6.425 GHz	43818-6 (244)	—
Cellular Radio, 824-894 MHz	43818-41 (247)	—
Low VSWR Assemblies, 0.3-8 GHz	(248)	—
Low VSWR Jumper Assemblies, Microwave	(240)	—
Standard Jumper Assemblies (see page)	(248)	—
AM Radio Sampling Lines (see page)	35422-14 (246)	—
Electrical Characteristics		
Maximum Frequency, GHz	8.8	10
Velocity, percent	88	88
Peak Power Rating, kW	19	13
Attenuation*, dB/100 ft (dB/100 m)		
1 MHz	0.066 (0.216)	0.060 (0.197)
10 MHz	0.211 (0.692)	0.192 (0.630)
100 MHz	0.685 (2.25)	0.623 (2.04)
1000 MHz	2.34 (7.68)	2.14 (7.02)
2000 MHz	3.45 (11.3)	3.17 (10.4)
Average Power Rating**, kW		
1 MHz	19	13
10 MHz	6.1	4.69
100 MHz	1.88	1.45
1000 MHz	0.55	0.421
2000 MHz	0.373	0.284
Mechanical Characteristics		
Outer Conductor	Copper	Copper
Diameter over Jacket, in (mm)	0.64 (16)	0.64 (16)
Minimum Bending Radius, in (mm)	5 (125)	5 (125)
Cable Weight, lb/ft (kg/m)	0.15 (0.22)	0.13 (0.19)

*For other frequencies and definition of standard conditions, see page 218.

**For other frequencies and definition of standard conditions, see page 217.



Connector Type Numbers

	Interface	For 1/2" LDF4-50A	For 1/2" LDF4-75A
A	"F" Flange (male) for attachment to "F" Series antennas	L44F	—
B	7/8" EIA Flange, no gas barrier at interface, includes inner connector	L44R	—
C	N Plug (male), mates with UG-23, 50-ohm mating pin	L44W	L44W-75
C	N Plug (male), mates with UG-23, low VSWR	L44EW†	—
C	N Plug (male), mates with UG-95, 70-ohm mating pin	—	L44W-70
D	N Jack (female), mates with UG-21, 50-ohm mating pin	L44N	L44N-75
D	N Jack (female), mates with UG-21, low VSWR	L44EN†	—
D	N Jack (female), mates with UG-94, 70-ohm mating pin	—	L44N-70
E	UHF Plug (male), mates with SO-239A	L44P	L44P-75
F	UHF Jack (female), mates with PL-259A	L44U	L44U-75
G	LC Plug (male) mates with UG-352	L44M	—
H	HN Plug (male) mates with UG-60	L44J	—
J	7/16 DIN (male)	L44DM	—
K	7/16 DIN (female)	L44DF	—
L	End Terminal, for strap connection to center conductor	L44T	—
M	Right Angle N Plug (male), mates with UG-23, 50-ohm mating pin	43716	206161
N	Right Angle 7/8" EIA Flange, no gas barrier at interface, includes inner connector	124990-1	—
O	CATV Equipment Housing Connector	—	48070
P	Splice	L44Z	—

† Connector for low-VSWR applications. Includes gold-plated inner conductor.

For dimensions and weights, see page 250. For RF connector adaptors, see page 251. For rigid line components, see pages 262-271.

Low-loss 7/8" diameter HELIAX foam dielectric cables are designed for use as feeders for antennas up to 5 GHz. Common applications include VLF and AM radio broadcast, HF communication systems, FM radio broadcast, VHF and UHF two-way radio communication systems, cellular systems, earth station antennas and point-to-point terrestrial applications. LDF5-50A is the standard of the industry for land mobile radio base station applications.

LDF5-50A offers attenuation performance approaching air-dielectric cables of similar size without the requirement for pressurization. FHJ5-75 is offered for 75 ohm applications.

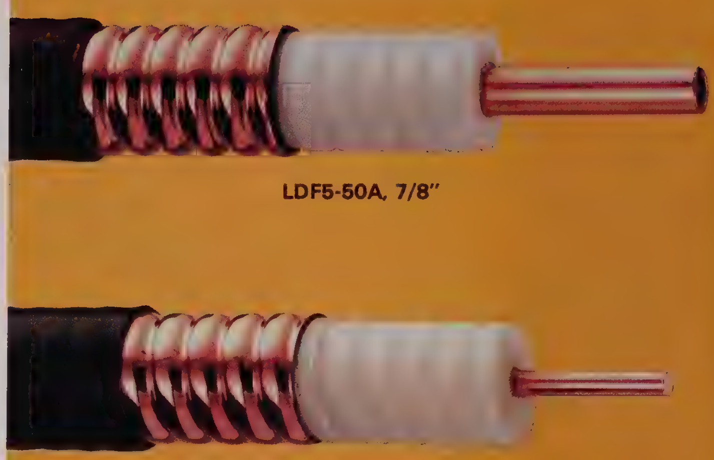
For indoor installations, fire-retardant, jacketed versions, listed by Underwriters' Laboratories, Inc., are available.

For military applications, a version of LDF5-50A, which has been qualified to MIL-C-28830, is available.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, See page 213.



LDF5-50A, 7/8"

FHJ5-75, 7/8"

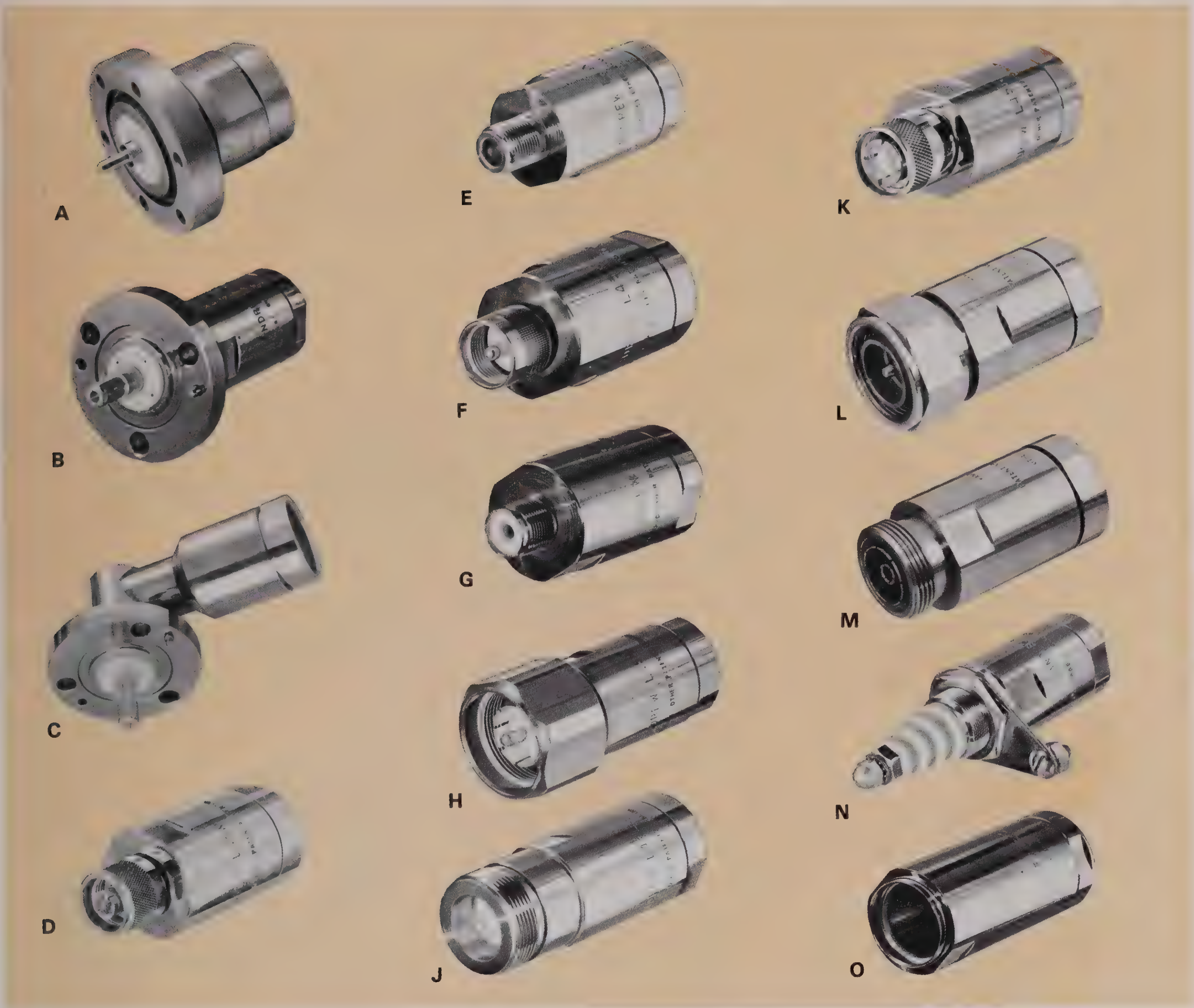
For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

Characteristics

Nominal Size	**7/8"**	**7/8"**
Impedance, ohms	**50**	**75**
Cable Type Numbers		
Standard Cable, Standard Jacket	**LDF5-50A**	**FHJ5-75**
Standard Cable, Fire-Retardant Jacket	**41690-9**	**41690-45**
Specially Selected and Tested Cables	(See referenced pages for details)	
Microwave, 1427-2700 MHz	LDF5P-50A (240)	—
Earth Station, 3.625-4.2 GHz	42150B-39 (244)	—
Cellular Radio, 824-894 MHz	41250B-48 (247)	—
Electrical Characteristics		
Maximum Frequency, GHz	5.0	5.0
Velocity, percent	89	79
Peak Power Rating, kW	44	29
Attenuation*, dB/100 ft (dB/100 m)		
1 MHz	0.035 (0.115)	0.038 (0.123)
10 MHz	0.113 (0.371)	0.123 (0.403)
100 MHz	0.369 (1.21)	0.428 (1.40)
1000 MHz	1.31 (4.3)	1.75 (5.74)
2000 MHz	1.97 (6.46)	2.82 (9.24)
Average Power Rating**, kW		
1 MHz	44	29.0
10 MHz	17.7	11.5
100 MHz	5.4	3.30
1000 MHz	1.5	0.808
2000 MHz	1.0	0.502
Mechanical Characteristics		
Outer Conductor	Copper	Copper
Diameter over Jacket, in (mm)	1.10 (28)	1.09 (27.5)
Minimum Bending Radius, in (mm)	10 (250)	10 (250)
Cable Weight, lb/ft (kg/m)	0.33 (0.49)	0.44 (0.65)

*For other frequencies and definition of standard conditions, see page 218.

**For other frequencies and definition of standard conditions, see page 217.



Connector Type Numbers

	Interface	For 7/8" LDF5-50A	For 7/8" FHJ5-75
A	"F" Flange (male) for attachment to "F" Series antennas	L45F	—
B	7/8" EIA Flange, no gas barrier at interface, includes inner connector	L45R	—
C	Right Angle 7/8" EIA Flange, no gas barrier at interface, includes inner connector	124800-1	—
D	N Plug (male), mates with UG-23	L45W	—
E	N Jack (female), mates with UG-21, 50 ohm mating pin	L45N	45AN-75
F	UHF Plug (male), mates with SO-239A	L45P	—
G	UHF Jack (female), mates with PL-259A	L45U	—
H	LC Plug (male), mates with UG-352	L45M	—
J	LC Jack (female), mates with UG-254	L45L	—
K	HN Plug (male), mates with UG-60	L45J	—
L	7/16 DIN male	L45DM	—
M	7/16 DIN female	L45DF	—
N	End Terminal, for strap connection to center conductor	L45T	—
O	Splice	L45Z	—

For dimensions and weights, see page 250. For RF connector adaptors, see page 251.
For rigid line components, see pages 262-271.

1-1/4" and 1-5/8" Foam-Dielectric

LDF6-50 and LDF7-50A HELIAX foam-dielectric cables are designed for use as feeders for antennas up to 3.3 GHz and 2.5 GHz, respectively. Common applications include VLF, AM radio broadcast, HF communication systems, FM radio broadcast, VHF and UHF two-way radio communication systems and point-to-point terrestrial applications. A version of LDF7-50A is available to meet MIL-C-28830.

LDF6-50 provides a pressure path through the tubular inner conductor. All L46 connectors (except L46F) provide a pressure port on the connector body for completing a pressure path to air-dielectric feed antennas and other pressurized components.

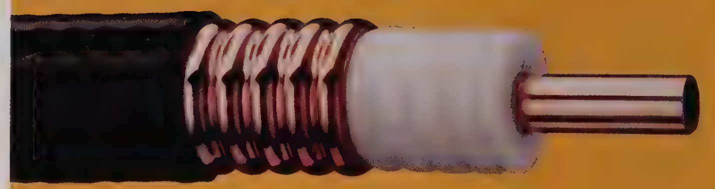
Fire retardant, jacketed versions of these cables are listed by Underwriter's Laboratories, Inc.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.



LDF6-50, 1-1/4"

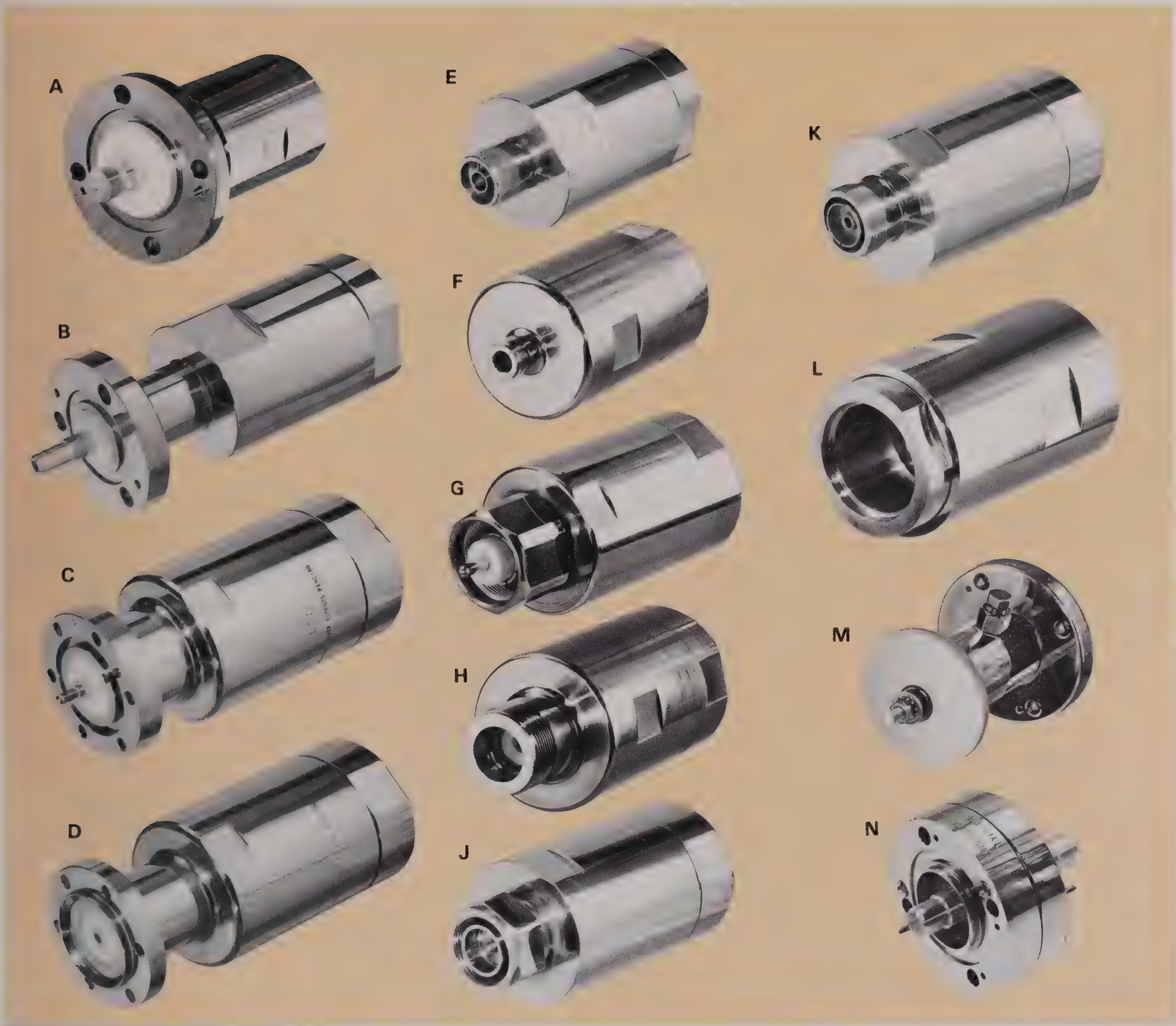
LDF7-50A, 1-5/8"

Characteristics

Nominal Size	**1-1/4"**	**1-5/8"**
Impedance, ohms	**50**	**50**
Cable Type Numbers		
Standard Cable, Standard Jacket	**LDF6-50**	**LDF7-50A**
Standard Cable, Fire-Retardant Jacket	**41690-46**	**41690-23**
Specially Selected and Tested Cables	(See referenced pages for details)	
Microwave, 1427-2700 MHz	LDF6P-50 (240)	—
1427-2300 MHz	—	LDF7P-50 (240)
Cellular Radio, 824-894 MHz	205360 (247)	42151A-18 (247)
Electrical Characteristics		
Maximum Frequency, GHz	3.3	2.5
Velocity, percent	89	88
Peak Power Rating, kW	90	145
Attenuation*, dB/100 ft (dB/100 m)		
1 MHz	0.026 (0.086)	0.021 (0.069)
10 MHz	0.084 (0.275)	0.068 (0.223)
100 MHz	0.275 (0.901)	0.225 (0.740)
1000 MHz	0.967 (3.17)	0.819 (2.69)
2000 MHz	1.45 (4.77)	1.25 (4.10)
Average Power Rating**, kW		
1 MHz	90	143
10 MHz	30.5	44.5
100 MHz	9.30	13.4
1000 MHz	2.64	3.69
2000 MHz	1.76	2.42
Mechanical Characteristics		
Outer Conductor	Copper	Copper
Diameter over Jacket, in (mm)	1.6 (40)	2.0 (50)
Minimum Bending Radius, in (mm)	15 (380)	20 (508)
Cable Weight, lb/ft (kg/m)	0.66 (0.98)	0.92 (1.36)

*For other frequencies and definition of standard conditions, see page 218.

**For other frequencies and definition of standard conditions, see page 217.



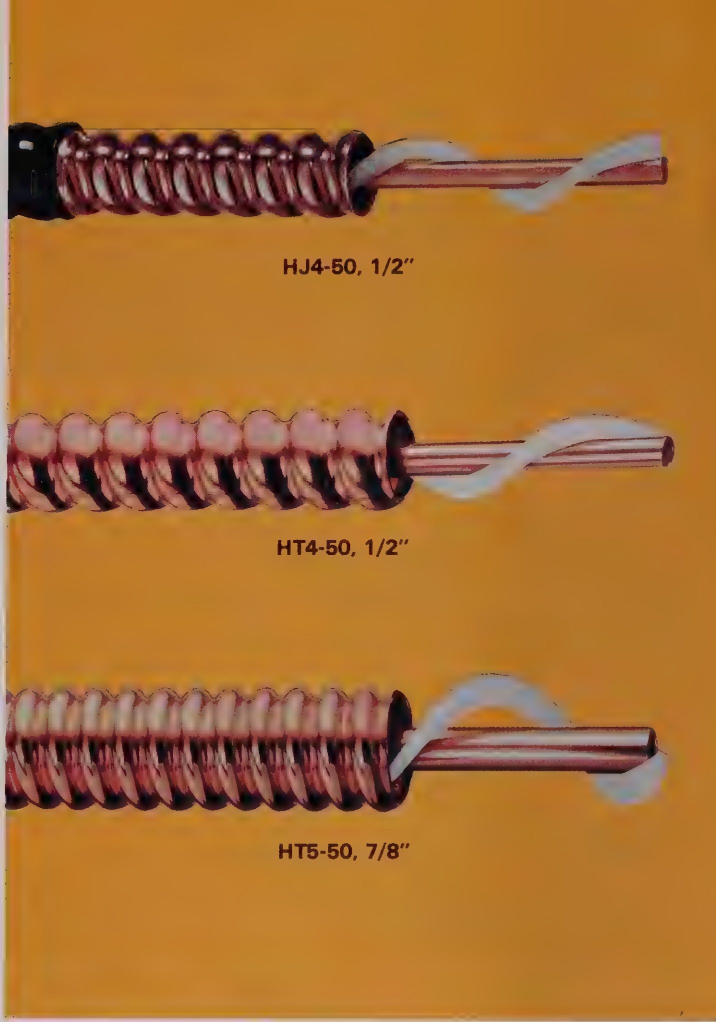
Connector Type Numbers

	Interface	For 1-1/4" LDF6-50	For 1-5/8" LDF7-50A
A	1-5/8" EIA Flange, no gas barrier at interface, includes inner connector	L46R†	L47R
B	7/8" EIA Flange, no gas barrier at interface, includes inner connector	L46S†	L47S
C	"F" Flange (male) for attachment to "F" series antennas	L46F	L47F
D	"F" Flange (female) for connection to jumper cable (see page 240)	—	201942
E	N Plug (male), mates with UG-23	L46W†	—
F	N Jack (female), mates with UG-21	L46N†	L47N
G	LC Plug (male), mates with UG-352	L46M†	L47M
H	LC Jack (female), mates with UG-154	L46L†	L47L
J	7/16 DIN male	L46DM†	L47DM
K	7/16 DIN female	L46DF†	L47DF
L	Splice	L46Z	L47Z
M	1-5/8" End Terminal, for strap connection to center conductor, includes inner connector. Use with Type L46R or L47R	2061	2061
N	1-5/8" Gas Barrier, for connecting Type L46R or L47R to pressurized line, includes inner connector	1261B	1261B

† Includes pressure port for pressurization of antenna feed.

For dimensions and weights, see page 250. For RF connector adaptors, see page 251. For rigid line components, see pages 262-271.

1/2" and 7/8" Air-Dielectric



Types HT4-50 and HT5-50 incorporate a teflon dielectric spacer and are provided unjacketed to allow use in high ambient temperature and high average power applications. Type HJ4-50 incorporates a polyethylene dielectric for lowest attenuation.

Common applications for HT4-50 and HT5-50 include shipboard, airborne, land based military, offshore drilling rig, FM broadcast and plenum applications.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

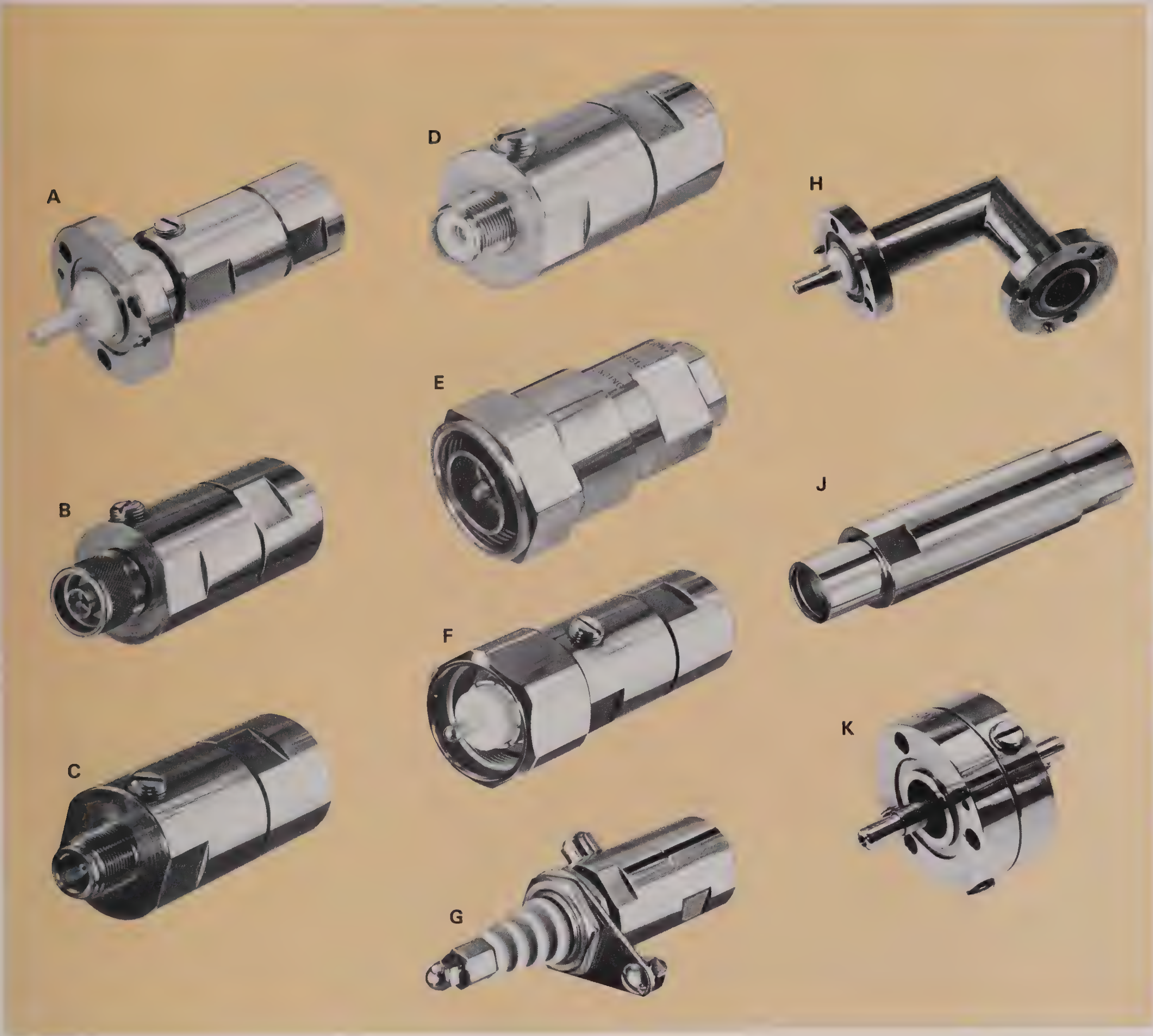
Characteristics

Nominal Size	1/2"	1/2"	7/8"
Impedance, ohms	50	50	50
Cable Type Numbers			
Standard Cable, Standard Jacket	**HJ4-50**	**HT4-50†**	**HT5-50†**
Standard Cable, Fire-Retardant Jacket	**41690-49**	—	—
Electrical Characteristics			
Maximum Frequency, GHz	10.9	10.9	5.2
Velocity, percent	91.4	92.0	92.5
Peak Power Rating, kW	10.0	10.0	44
Attenuation*, dB/100 ft (dB/100 m)			
1 MHz	0.080 (0.262)	0.082 (0.270)	0.036 (0.118)
10 MHz	0.260 (0.853)	0.265 (0.870)	0.118 (0.387)
100 MHz	0.830 (2.72)	0.888 (2.91)	0.419 (1.38)
1000 MHz	2.65 (8.70)	3.31 (10.9)	1.78 (5.85)
2000 MHz	3.85 (12.6)	5.11 (16.7)	2.91 (9.56)
Average Power Rating**, kW Condition A (Condition B)			
1 MHz	10.0 (10.0)	10.0 (10.0)	44.0 (44.0)
10 MHz	6.6 (10.0)	10.0 (10.0)	44.0 (44.0)
100 MHz	2.1 (3.3)	5.40 (6.48)	14.5 (17.4)
1000 MHz	0.64 (1.0)	1.45 (1.74)	3.41 (4.09)
2000 MHz	0.44 (0.68)	0.939 (1.13)	2.08 (2.50)
Mechanical Characteristics			
Outer Conductor	Copper	Copper	Copper
Diameter over Jacket, in (mm)	0.58 (14.7)	†	†
Diameter over Copper Outer Conductor, in (mm)	.50 (12.7)	.50 (12.7)	1.01 (25.7)
Minimum Bending Radius, in (mm)	5 (125)	5 (125)	10 (250)
Cable Weight, lb/ft (kg/m)	0.25 (0.37)	0.22 (0.33)	0.47 (0.70)

*For other frequencies and definition of standard conditions, see page 216.

**For other frequencies and definition of standard conditions, see pages 214 and 215.

† Unjacketed



Connector Type Numbers

	Interface	For 1/2" HJ4-50	For 1/2" HT4-50	For 7/8" HT5-50
A	7/8" EIA Flange, no gas barrier at interface, includes inner connector	—	—	75AR
A	7/8" EIA Flange, with gas barrier, includes inner connector	—	—	75AG
B	N Plug (male), mates with UG-23	74AW	74AW	75AW
C	N Jack (female), mates with UG-21	74AN	74AN	75AN
D	UHF Jack (female), mates with PL-259A	74U	74U	75AU
E	7/16" DIN male	—	—	75DM
F	LC Plug (male), mates with UG-352	—	—	75AM
G	End Terminal, for strap connection to cable conductor	74T	74T	75AT
H	90° 7/8" EIA Mitre Elbow, includes inner connector	—	—	1060
J	Splice	74Z	74Z	75AZ
K	7/8" EIA Gas Barrier, includes one inner connector	—	—	1260A

For dimensions and weights, see page 250. For RF connector adaptors, see page 251.
For rigid line components, see pages 262-271.

Common applications of 7/8" diameter air-dielectric HELIAX cables include point-to-point terrestrial microwave, earth station, HF, AM and FM broadcast, ITFS, MMDS and MDS antenna systems. HJ5P-50 is the industry standard for 2 GHz air-dielectric microwave antenna feeders.

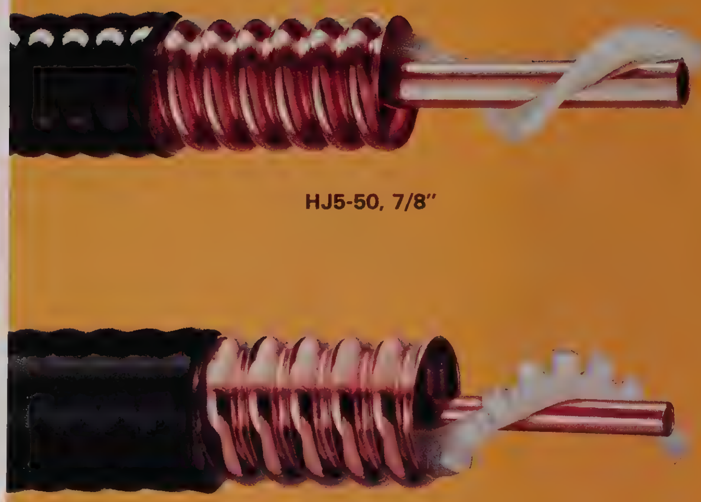
The combination of strength and flexibility inherent in the HELIAX construction make it ideal for these applications.

HELIAX cables can be orered to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.



HJ5-50, 7/8"

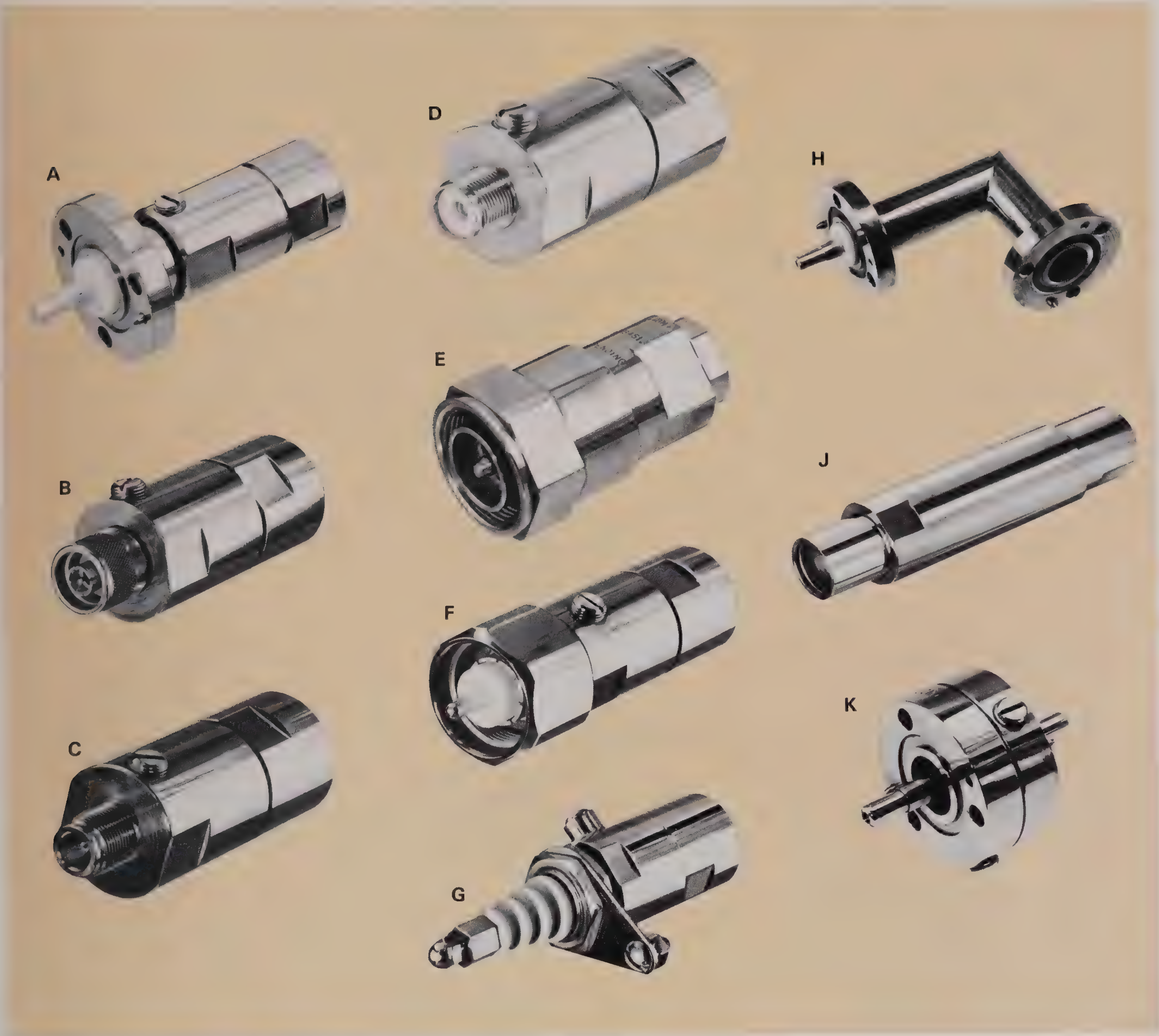
HJ5-75, 7/8"

Characteristics

Nominal Size	**7/8"**	**7/8"**
Impedance, ohms	**50**	**75**
Cable Type Numbers		
Standard Cable, Standard Jacket	**HJ5-50**	**HJ5-75**
Standard Cable, Fire-Retardant Jacket	**41690-10**	**41690-47**
Specially Selected and Tested Cables	(See referenced pages for details)	
Microwave, 1700-2700 MHz	HJ5P-50 (242)	—
Earth Station, 3.625-4.2 GHz	25831-2 (244)	—
Cellular Radio, 824-894 MHz	25831-3 (247)	—
Electrical Characteristics		
Maximum Frequency, GHz	5.2	5.6
Velocity, percent	91.6	90
Peak Power Rating, kW	44	29
Attenuation*, dB/100 ft (dB/100 m)		
1 MHz	0.035 (0.115)	0.036 (0.116)
10 MHz	0.114 (0.374)	0.116 (0.381)
100 MHz	0.57 (1.21)	0.388 (1.27)
1000 MHz	1.27 (4.17)	1.29 (4.23)
2000 MHz	1.85 (6.07)	1.92 (6.30)
Average Power Rating**, kW, Condition A (Condition B)		
1 MHz	44 (44)	29 (29)
10 MHz	21.6 (33.5)	14.3 (22.2)
100 MHz	6.4 (9.9)	4.3 (6.7)
1000 MHz	1.85 (2.9)	1.30 (2.0)
2000 MHz	1.30 (2.0)	0.85 (1.3)
Mechanical Characteristics		
Outer Conductor	Copper	Copper
Diameter over Jacket, in (mm)	1.11 (28.2)	1.11 (28.2)
Diameter over Copper Outer Conductor, in (mm)	1.01 (25.7)	1.01 (25.7)
Minimum Bending Radius, in (mm)	10 (250)	10 (250)
Cable Weight, lb/ft (kg/m)	0.54 (0.80)	0.55 (0.81)

*For other frequencies and definition of standard conditions, see page 216.

**For other frequencies and definition of standard conditions, see pages 214 and 215.



Connector Type Numbers

	Interface	For 7/8" HJ5-50	For 7/8" HJ5-75
A	7/8" EIA Flange, no gas barrier at interface, 50-ohm mating pin, includes inner connector	75AR	75AR-75
A	7/8" EIA Flange, with gas barrier, 50-ohm mating pin, includes inner connector	75AG	—
B	N Plug (male), mates with UG-23, 50-ohm mating pin	75AW	75AW-75
C	N Jack (female), mates with UG-21, 50-ohm mating pin	75AN	75AN-75
D	UHF Jack (female), mates with PL-259A, 50-ohm mating pin	75AU	75AU-75
E	7/16" DIN male	75DM	—
F	LC Plug (male), mates with UG-352, 50-ohm mating pin	75AM	75AM-75
G	End Terminal, for strap connection to cable conductor	75AT	75AT-75
H	90° 7/8" EIA Mitre Elbow, includes inner connector	1060	—
J	Splice	75AZ	75AZ-75
K	7/8" EIA Gas Barrier, includes one inner connector	1260A	—

For dimensions and weights, see page 250. For RF connector adaptors, see page 251. For rigid line components, see pages 262-271.

HELIAX® Coaxial Cable
1-5/8" Air-Dielectric

HJ7-50A, 1-5/8"

HJ7-75, 1-5/8"

1-5/8" diameter air-dielectric HELIAX cables are designed for use as feeders for antenna installations up to 3.0 GHz.

Common applications include point-to-point terrestrial microwave, HF, AM and FM broadcast, ITFS, MMDS and MDS antenna systems. The combination of strength and flexibility inherent in the HELIAX construction make it ideal for these applications.

A high power version of HJ7-50A incorporates a special polyolefin dielectric. Average power rating at 100 MHz, condition A, for this version is 18.1 kW, while condition B is 25.3 kW.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using standard hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

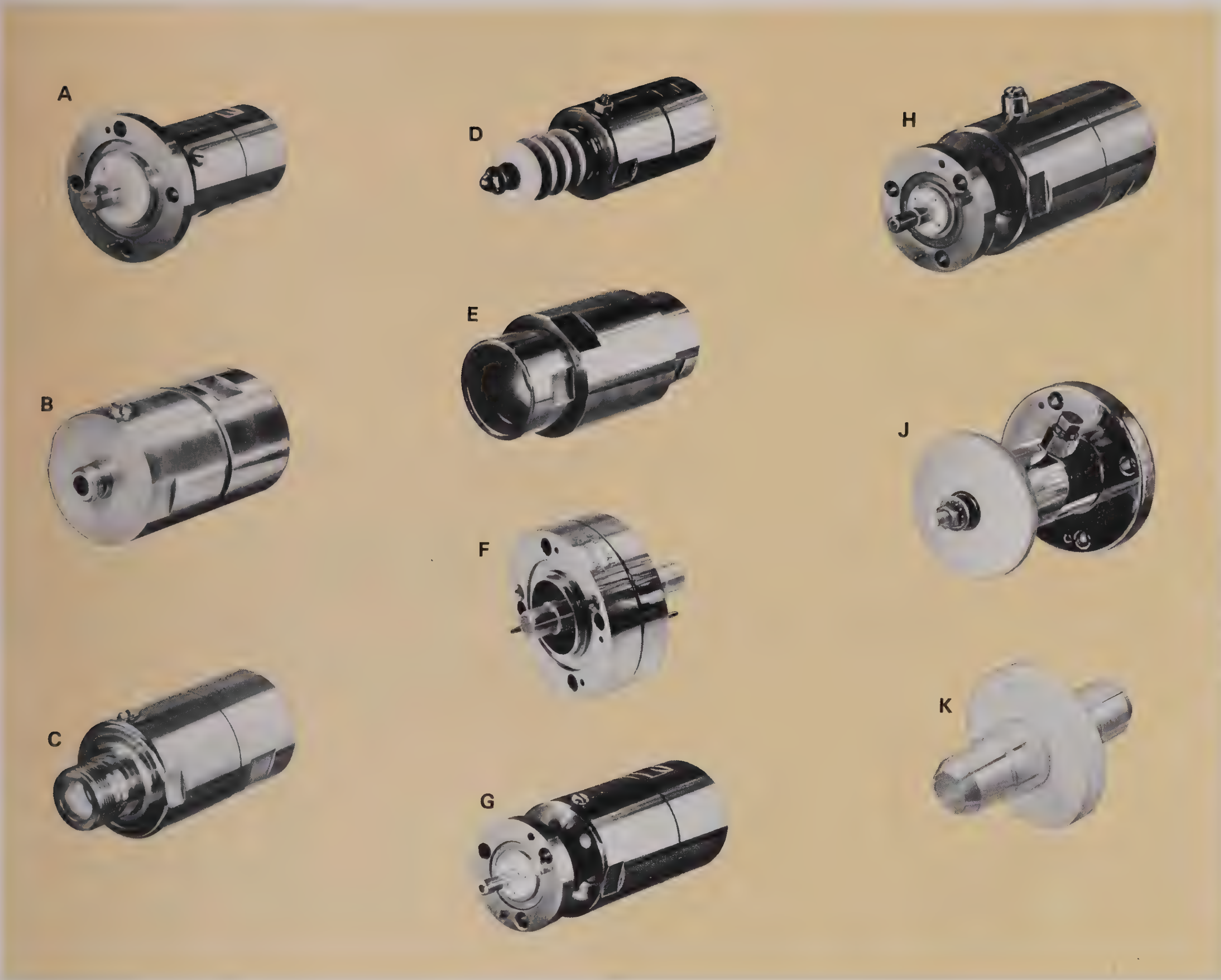
For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.

Characteristics

Nominal Size	**1-5/8"**	**1-5/8"**
Impedance, ohms	**50**	**75**
Cable Type Numbers		
Standard Cable, Standard Jacket	**HJ7-50A**	**HJ7-75**
Standard Cable, Fire-Retardant Jacket	**41690-11**	**41690-48**
Specially Selected and Tested Cables	(See referenced pages for details)	
Microwave, 1700-2700 MHz	HJ7P-50A (242)	—
1700-2300 MHz	HJ7SP-50A (242)	—
Broadcast, 54-806 MHz	42140 (245)	—
Cellular Radio, 824-894 MHz	25816A-31 (247)	—
High Power Version	27591-101	—
Electrical Characteristics		
Maximum Frequency, GHz	2.7	3.0
Velocity, percent	92.1	92.4
Peak Power Rating, kW	145	98
Attenuation*, dB/100 ft (dB/100 m)		
1 MHz	0.020 (0.066)	0.016 (0.052)
10 MHz	0.064 (0.210)	0.057 (0.187)
100 MHz	0.207 (0.679)	0.200 (0.656)
1000 MHz	0.70 (2.30)	0.710 (2.33)
1500 MHz	0.88 (2.89)	0.900 (2.95)
2000 MHz	1.05 (3.45)	1.09 (3.58)
Average Power Rating**, kW, Condition A (Condition B)		
1 MHz	145 (145)	98.0 (98.0)
10 MHz	48 (74)	55.0 (85.3)
100 MHz	14.4 (22.3)	15.5 (24.0)
1000 MHz	4.3 (6.7)	4.3 (6.7)
1500 MHz	3.4 (5.3)	3.4 (5.3)
2000 MHz	2.9 (4.5)	2.85 (4.4)
Mechanical Characteristics		
Outer Conductor	Copper	Copper
Diameter over Jacket, in (mm)	2.00 (51.0)	1.98 (50.3)
Minimum Bending Radius, in (mm)	20 (508)	20 (508)
Cable Weight, lb/ft (kg/m)	1.04 (1.55)	1.04 (1.55)

*For other frequencies and definition of standard conditions, see page 216.

**For other frequencies and definition of standard conditions, see pages 214 and 215.



Connector Type Numbers

	Interface	For 1-5/8" HJ7-50A	For 1-5/8" HJ7-75
A	1-5/8" EIA Flange, no gas barrier at interface, 50-ohm mating pin, includes inner connector	87R	77AR-75
A	1-5/8" EIA Flange, 50-ohm mating pin, includes inner connector with gas barrier	87G	—
B	N Jack (female), mates with UG-21, 50-ohm mating pin	87N	77AN-75
C	LC Jack (female), mates with UG-154	87L	—
D	End Terminal, for strap connection to center conductor	87T	—
E	Splice	87Z	77AZ-75
F	1-5/8" EIA Gas Barrier, includes fixed male inner connector both ends	1261B	—
G	Reducer, 7/8" EIA Flange, includes inner connector, no gas barrier at interface	87S	—
H	Reducer, 7/8" Flange, includes inner connector and gas barrier	87SG	—
J	1-5/8" EIA End Terminal, includes inner connector	2061	—
K	1-5/8" EIA Inner Connector, with anchor bead	34660	—

For dimensions and weights, see page 250. For RF connector adaptors, see page 251. For rigid line components, see pages 262-271.

3", 4" and 5" Air-Dielectric

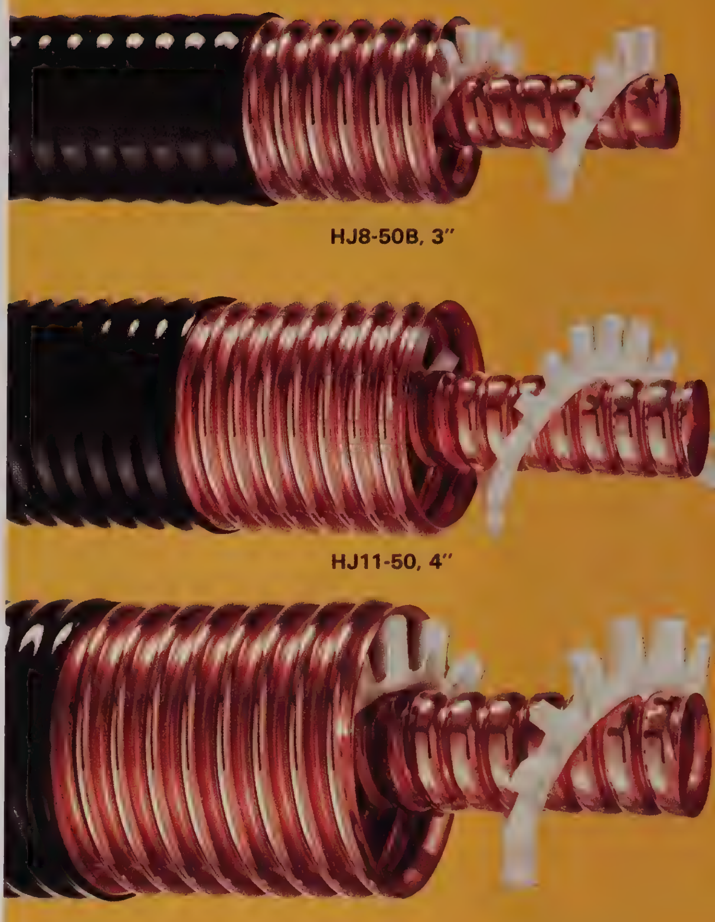
Large diameter HELIAX air-dielectric cables are designed for use as feeders for antennas up to 1.64 GHz. Common applications include HF, AM and FM broadcast, TV broadcast and over-the-horizon radar antenna systems. These HELIAX air-dielectric cables are the industry standard for FM broadcast applications. The combination of strength and flexibility inherent in HELIAX construction make it the ideal choice for these applications.

HELIAX cables can be ordered cut to length and fitted with connectors per customer specifications. Cable can also be ordered in bulk lengths for field cutting and connector attachment, using hand tools.

For system planning information, see pages 2-42. For accessories, see pages 252-256.

To Order. Specify cable type number, connector type numbers and cable length in feet or metres. For additional ordering information, see page 213.

For return loss guarantees in frequency bands not listed, contact your local Andrew Sales Office listed inside the back cover.


HJ8-50B, 3"

HJ11-50, 4"

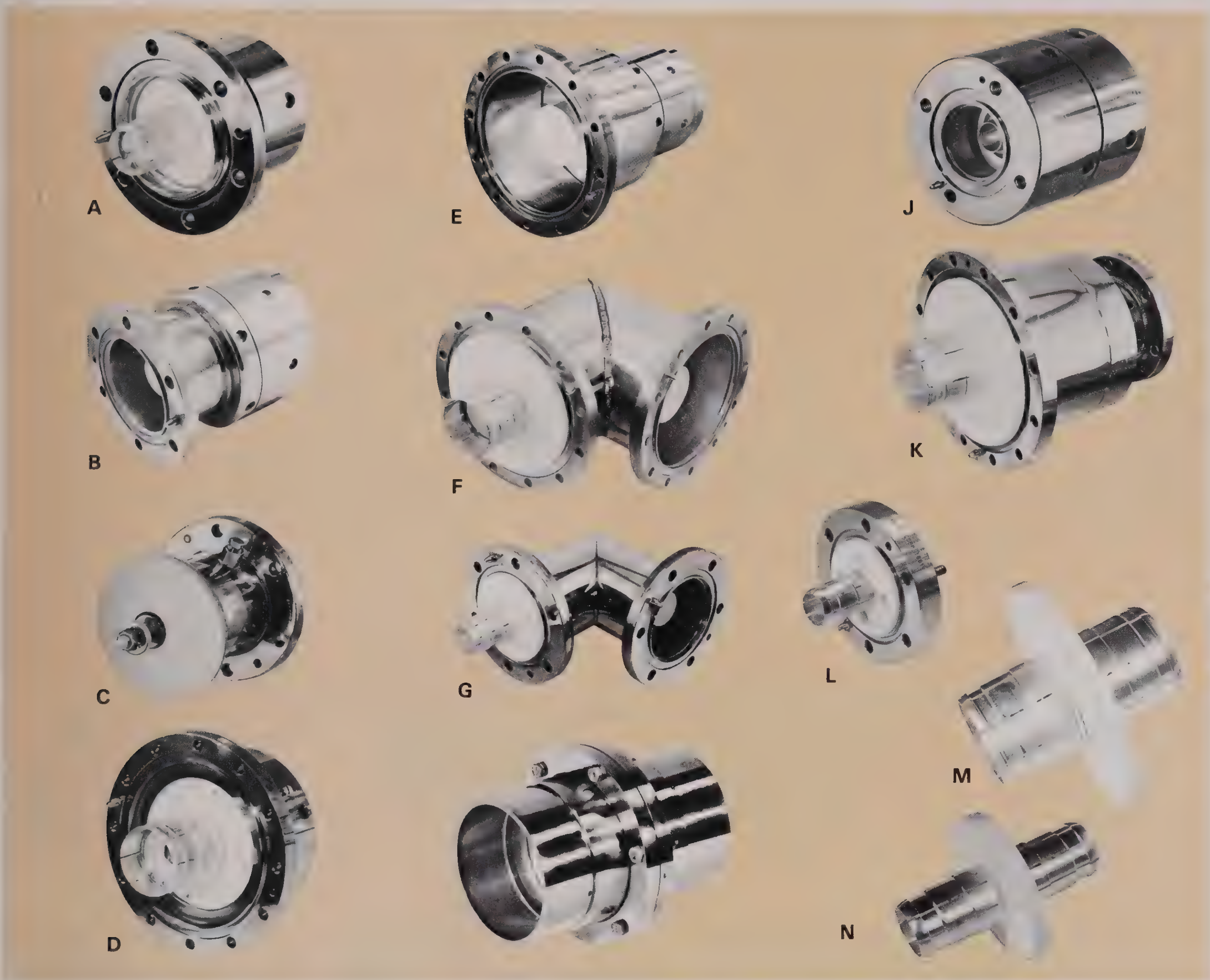
HJ9-50, 5"

Characteristics

Nominal Size	3"	4"	5"
Impedance, ohms	50	50	50
Cable Type Numbers			
Standard Cable, Standard Jacket	**HJ8-50B**	**HJ11-50**	**HJ9-50**
Specially Selected and Tested Cables	(See referenced pages for details)		
Broadcast, 54-806 MHz	42141 (245)	42144 (245)	42142 (245)
Electrical Characteristics			
Maximum Frequency, GHz	1.64	1.22	0.96
Velocity, percent	93.3	92	93.1
Peak Power Rating, kW	320	490	765
Attenuation*, dB/100 ft (dB/100 m)			
1 MHz	0.013 (0.043)	0.010 (0.033)	0.007 (0.024)
10 MHz	0.043 (0.141)	0.033 (0.108)	0.023 (0.076)
100 MHz	0.14 (0.459)	0.113 (0.371)	0.079 (0.259)
450 MHz	0.340 (1.12)	0.270 (0.886)	0.179 (0.587)
1000 MHz	0.560 (1.84)	0.430 (1.41)	0.285 (0.935)
Average Power Rating**, kW, Condition A (Condition B)			
1 MHz	320 (320)	490 (490)	765 (765)
10 MHz	124 (174)	190 (266)	247 (383)
100 MHz	37 (52)	56 (78.5)	73 (113)
450 MHz	15.7 (22)	24 (33.6)	33 (51)
1000 MHz	9.30 (13)	15 (21.0)	20 (31)
Mechanical Characteristics			
Outer Conductor	Copper	Copper	Copper
Diameter over Jacket, in (mm)	3.02 (76.6)	4.00 (102)	5.20 (133)
Minimum Bending Radius, in (mm)	30 (762)	40 (1016)	50 (1270)
Cable Weight, lb/ft (kg/m)	1.78 (2.6)	2.50 (3.72)	3.3 (4.9)

*For other frequencies and definition of standard conditions, see page 216.

**For other frequencies and definition of standard conditions, see pages 214 and 215.



Connector Type Numbers

	Interface	For 3" HJ8-50B	For 4" HJ11-50	For 5" HJ9-50
A	3-1/8" EIA Flange (male), with captivated inner connector	78ARM	—	—
A	3-1/8" EIA Flange (male), with captivated inner connector and gas barrier	78AGM	—	—
B	3-1/8" EIA Flange (female), no inner connector, with gas barrier	78AGF	81GF	—
B	3-1/8" EIA Flange (female), no inner connector, no gas barrier	78ARF	81RF	—
C	3-1/8" EIA End Terminal, includes inner connector	2062	2062	—
D	6-1/8" EIA Flange (male), with captivated inner connector, no gas barrier	—	—	79AR
D	6-1/8" EIA Flange (male), with captivated inner connector, with gas barrier	—	—	79AG
E	6-1/8" EIA Flange (female), no inner connector, no gas barrier	—	42896	—
E	6-1/8" EIA Flange (female), with inner connector, with gas barrier	—	42826	—
F	90° 6-1/8" EIA Mitre Elbow, includes inner connector	—	—	1073
G	90° 3-1/8" EIA Mitre Elbow, includes inner connector	1062	1062	—
H	Splice	78BZ	81Z	79AZ
J	Reducer, 1-5/8" EIA Flange, includes inner connector	78AS	—	—
K	Reducer, 6-1/8" to 3-1/8" EIA, includes two inner connectors	—	—	1872
L	Reducer, 3-1/8" to 1-5/8" EIA, captivated 3-1/8" inner connector	—	1861	—
M	6-1/8" EIA Inner Connector, with anchor bead	—	18902	—
N	3-1/8" EIA Inner Connector, with anchor bead	15093A	15093A	—

For dimensions and weights, see page 250. For RF connector adaptor, see page 251.
For rigid line components, see pages 262-271.

Andrew offers low VSWR versions of LDF series, HELIAX foam-dielectric coaxial cables for use in microwave radio relay systems. These cables are for use with the "F" series antennas operating from 1427 to 2700 MHz listed on pages 59-67. Type LDF6P-50 has a pressure path through the inner conductor and is also suitable for use with air-dielectric feed antennas. For applications below 1427 MHz, standard HELIAX cables are recommended. Refer to pages 224-231.

The low-loss foam construction (described on page 212-213) results in attenuation characteristics approaching those of air-dielectric cables of similar size.

Cables and fitted connectors are available for any standard U.S., Canadian, or CCIR frequency band. Other frequency bands are available on special order. All cable assemblies are sweep tested at the factory to ensure low VSWR performance across the specified operating band.

Accessories and Installation information presented on pages 252-255 applies to low-VSWR HELIAX.

To Order. Specify *frequency band, cable type number, connector type numbers,* and *cable length* in feet or metres.

Characteristics – LDF Series Foam-Dielectric HELIAX Cable Assemblies

Size	1/2"	7/8"	1-1/4"	1-5/8"
Type No.	LDF4P-50A	LDF5P-50A	LDF6P-50	LDF7P-50A
Impedance, ohms	50	50	50	50
VSWR, Max, (RL), Specify Frequency Band				
1427 – 1535 MHz	1.15 (23.1)*	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
1700 – 1900 MHz	1.15 (23.1)*	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
1850 – 1990 MHz	1.15 (23.1)*	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
1990 – 2110 MHz	1.15 (23.1)*	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
2110 – 2200 MHz	1.15 (23.1)*	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
1700 – 2110 MHz	1.15 (23.1)*	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
1900 – 2300 MHz	1.15 (23.1)*	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
2300 – 2700 MHz	1.15 (23.1)*	1.20 (20.8)	1.20 (20.8)	—
Attenuation at 2 GHz**, dB/100 ft (dB/100 m)	3.45 (11.3)	1.97 (6.46)	1.45 (4.77)	1.25 (4.10)
Velocity, percent	88	89	89	88
Diameter over Jacket, in (mm)	0.64 (16)	1.1 (28)	1.6 (40)	2.0 (51)
Minimum Bending Radius, in (mm)	5 (125)	10 (250)	15 (380)	20 (508)
Cable Weight, lb/ft (kg/m)	0.15 (0.22)	0.33 (0.49)	0.66 (0.98)	0.92 (1.37)

*1.2 for lengths over 100 ft (30 m)

**For other frequencies, refer to page 218.

Low-VSWR HELIAX Jumper Assemblies

LDF series jumper assemblies offer low attenuation, low VSWR, complete RF shielding, flexibility, and high mechanical strength for equipment room connections. Low-VSWR, 1/2", 50 ohm HELIAX cable and connectors are used. Every assembly is sweep-tested and guaranteed not to exceed the maximum VSWR specified. Type N Plug (male) connectors have gold-plated inner contact pins and nickel-plated external surfaces. Other connectors and cable lengths are also available.

Type No.	Frequency MHz	Length feet (m)	Attenuation dB	VSWR Max. (R.L.)
Type N Plug/Type N Plug Connectors				
44202-3	1427 – 1535	3 (0.9)	0.10	1.10 (26.4)
44202-6	1427 – 1535	6 (1.8)	0.19	1.10 (26.4)
41656B-3	1700 – 2300	3 (0.9)	0.12	1.10 (26.4)
41656B-6	1700 – 2300	6 (1.8)	0.24	1.10 (26.4)
42128B-3	1700 – 2300	3 (0.9)	0.12	1.06 (30.7)
42128B-6	1700 – 2300	6 (1.8)	0.24	1.06 (30.7)
48695-3	2300 – 2700	3 (0.9)	0.14	1.10 (26.4)
48695-6	2300 – 2700	6 (1.8)	0.28	1.10 (26.4)
7/8" EIA Flange/N Plug Connectors				
200834-3	1700 – 2300	3 (0.9)	0.12	1.06 (30.7)
200834-6	1700 – 2300	6 (1.8)	0.24	1.06 (30.7)
"F" Flange Male/"F" Flange Male Connectors				
202376-3	1700 – 2300	3 (0.9)	0.12	1.15 (23.1)
202376-6	1700 – 2300	6 (1.8)	0.24	1.15 (23.1)

Weatherproof. Connector "O" ring seals, in conjunction with the annular corrugations of the cable, provide a longitudinal moisture block. To eliminate differential expansion, the dielectric is mechanically locked to the outer conductor and bonded to the inner conductor.

Self-Flaring. This patented* innovation results in simplified assembly, excellent electrical contact and high resistance to connector pull-off and twist-off. Each connector is designed for low VSWR up to the cut-off frequency of the cable.

Type "F" Flange. Most standard connectors used on air-dielectric cables and some unpressurized antenna feeds have air spaces (Figure 1) where moisture can collect if they are not pressurized. Because a small amount of moisture can seriously degrade VSWR and increase loss at microwave frequencies, these connectors are not suitable for use in an unpressurized system. To insure a completely void-free connection between the cable and antenna, Andrew developed a special weatherproof "F" foam-filled feed input flange and the mating "F" connector (Figure 2).

*U.S. Patent 4,046,451.

Figure 1 – 7/8" EIA Flange Connection

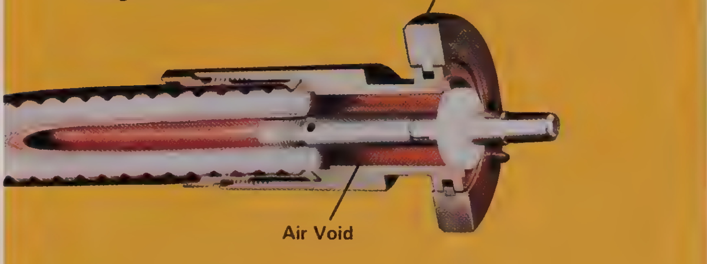
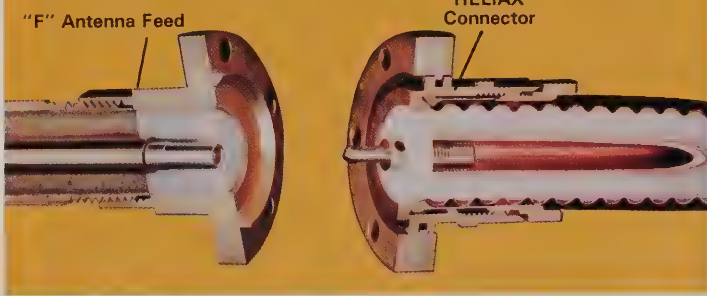
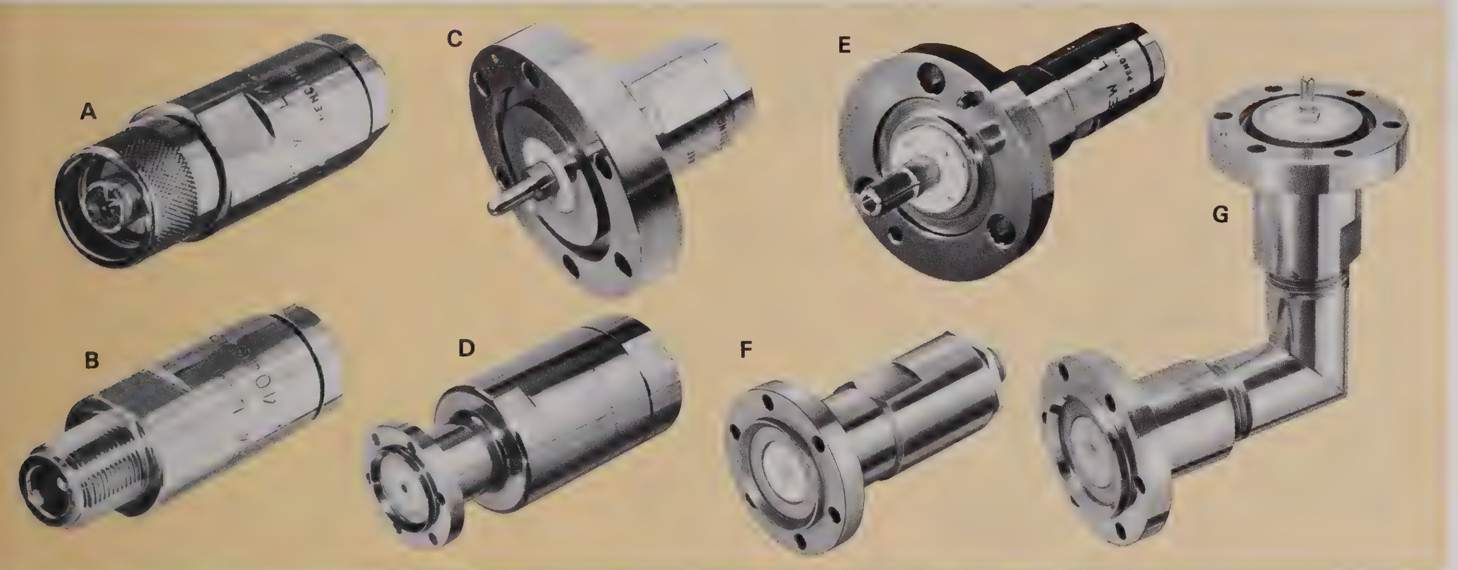


Figure 2 – "F" Flange and "F" Antenna Feed

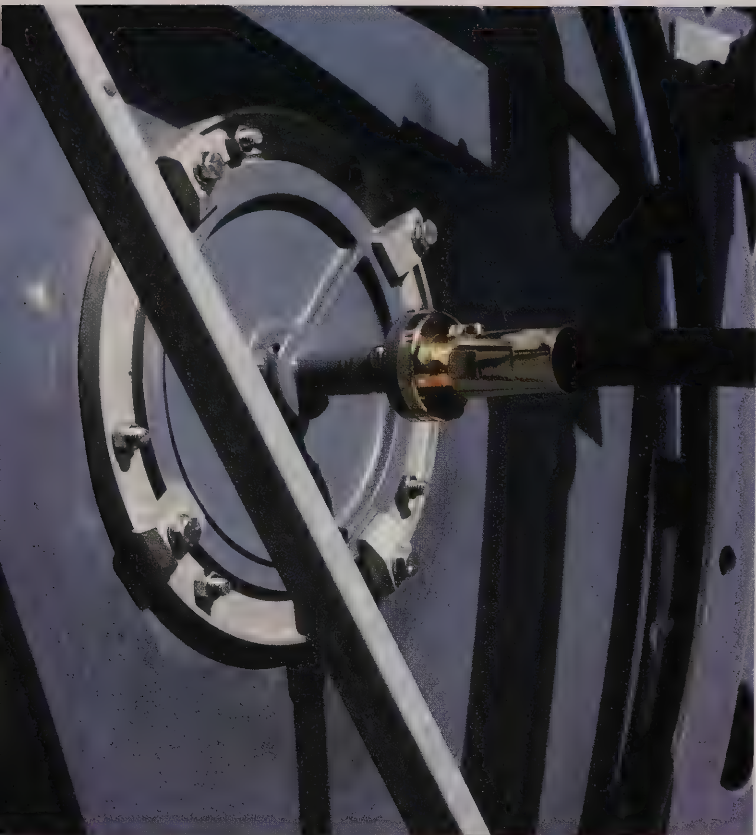




Connectors and Components

	Interface	For 1/2" LDF4P-50A	For 7/8" LDF5P-50A	For 1-1/4" LDF6P-50	For 1-5/8" LDF7P-50A	Components
A	N Plug (male), mates with UG-23	L44EW	L45W	L46W*	—	—
B	N Jack (female), mates with UG-21	L44EN	L45N	L46N*	L47N	—
C	"F" Flange (male), for attachment to "F" series antennas	L44F	L45F	L46F	L47F	—
D	"F" Flange (female), use with jumper cables having "F" Flange (male) connectors.	—	48041	—	201942	—
E	7/8" EIA Flange, includes Inner Conductor. No gas barrier.	L44R	L45R	L46S*	L47S	—
F	Adaptor "F" Flange (female), Type N Jack (female). Allows testing of feeders terminated with "F" Flange male connectors.	—	—	—	—	104300-2
G	Elbow, "F" Flange (male), "F" Flange (female)	—	—	—	—	203361

*Includes pressure port and pipe plug



Andrew offers low-VSWR versions of HELIAX air-dielectric coaxial cable for use in microwave radio relay systems. These cables are for use with air-dielectric antennas operating in the 1700 – 2700 MHz range listed on pages 60-67. Type LDF6P-50 (1-1/4") cable, listed on page 240, provides a pressure path through the inner conductor and can also be used with air-dielectric antennas. For applications below 1700 MHz, standard HELIAX cables are recommended. Refer to pages 224-231.

Assemblies are available for any standard U.S., Canadian, or CCIR frequency band. Other frequency bands are available on special order. All cable assemblies are sweep-tested at the factory to assure low-VSWR performance across the specified operating band.

The recommended cable and connector combinations for specific frequency ranges are listed in the table at the bottom of this page. The maximum VSWR specifications are guaranteed for these combinations.

Accessories and Installation information presented on pages 252-256 applies to low-VSWR HELIAX cable.

Low-VSWR HELIAX Foam-Dielectric Jumper Assemblies for equipment room connection are presented on pages 248-249.

To Order. Specify *frequency band, cable type number, connector type numbers,* and *cable length* in feet or metres.

Characteristics – Air-Dielectric HELIAX Cable Assemblies

Size	7/8"	1-5/8"	1-5/8"
Type No.	**HJ5P-50**	**HJ7SP-50A**	**HJ7P-50A**
VSWR, (R.L.) Maximum (with recommended connectors)	1.08 (28.3)	1.10 (26.4)†	1.15 (23.1)
Attenuation at 2 GHz* dB/100 ft (dB/100 m)	1.8 (5.9)	1.1 (3.6)	1.1 (3.6)
Impedance, ohms	50	50	50
Frequency, MHz, Specify Frequency Band	1700 – 1900 1850 – 1990 2110 – 2200 1700 – 2110 1900 – 2300 2300 – 2700	1700 – 1900 1850 – 1990 2110 – 2200 1700 – 2110 1900 – 2300 — — —	1700 – 1900 1850 – 1990 2110 – 2200 1700 – 2110 1900 – 2300 2300 – 2700
Velocity, percent	91.6	92.1	92.1
Diameter over Jacket, in (mm)	1.1 (28)	2.0 (51)	2.0 (51)
Minimum Bending Radius, in (mm)	10 (250)	20 (508)	20 (508)
Cable Weight, lb/ft (kg/m)	0.54 (0.80)	1.04 (1.55)	1.04 (1.55)

*For other frequencies, refer to page 216.

†1.12 (24.8) with 87WT and 87NT

Recommended Connectors

Cable Type	Bandwidth	7/8" EIA Flange No Gas Barrier	7/8" EIA Flange Gas Barrier	Type N Plug (male)	Type N Jack (female)
HJ5P-50	Up to 200 MHz	**75AR**	**75AG**	**75WT**	**75NT**
HJ5P-50	200 – 410 MHz	**75RT**	**75GT**	**75WT**	**75NT**
HJ7SP-50A	Up to 410 MHz	**87ST**	**87SGT**	**87WT**	**87NT**
HJ7P-50A	Up to 150 MHz	**87S**	**87SG**	**87WT**	**87NT**
HJ7P-50A	150 – 410 MHz	**87ST**	**87SGT**	**87WT**	**87NT**

Selection of Connectors. Some applications, depending on bandwidth and cable type, require tunable connectors to achieve the specified VSWR ratings. Refer to the table on page 242 for connector recommendations. For example, tunable Type N or non-tunable 7/8″ EIA connectors are recommended for use with Type HJ5P-50 cable operating in the 1850 – 1990 MHz band (under 200 MHz bandwidth).

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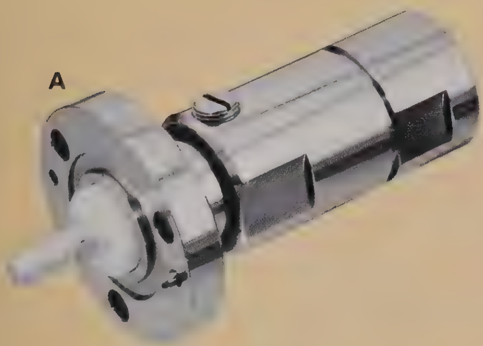

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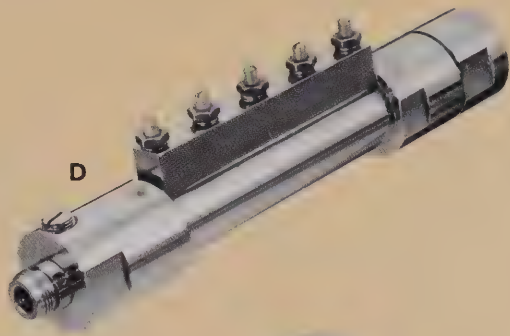

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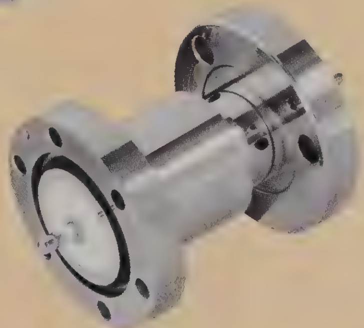

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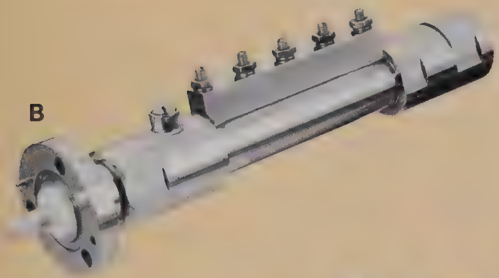

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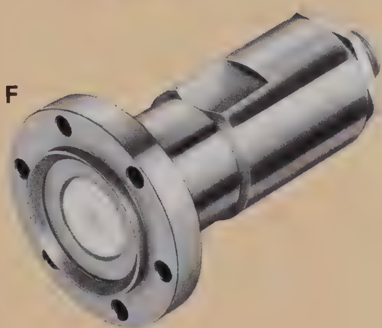

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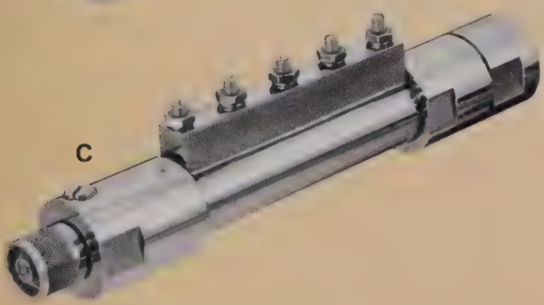


Connectors and Components

	Interface	For 7/8″ HJ5P-50	For 1-5/8″ HJ7P-50A and HJ7SP-50A	Components
A	7/8″ EIA Flange, no gas barrier at interface	75AR	87S	—
A	7/8″ EIA Flange, gas barrier	75AG	87SG	—
B	Tunable 7/8″ EIA Flange, no gas barrier at interface	75RT	87ST	—
B	Tunable 7/8″ EIA Flange, gas barrier	75GT	87SGT	—
C	Tunable N Plug (male), mates with UG-23	75WT	87WT	—
D	Tunable N jack (female), mates with UG-21	75NT	87NT	—
E	Adaptor. 7/8″ EIA, "F" Flange (male). For attaching air-dielectric HELIAX cable with 7/8″ EIA Flange to "F" series antenna, includes gas barrier.	—	—	33682
F	Adaptor. "F" Flange (female), Type N Jack (female). Allows testing of feeders terminated with "F" Flange male connectors.	—	—	104300-2

HELIAX Coaxial Cables. Low VSWR, HELIAX foam dielectric coaxial cables of special interest for satellite earth station applications are listed below. For additional information on earth station antenna system planning, see pages 28-31.

HELIAX Low VSWR Cable Assemblies for ESA Applications

			Maximum VSWR Assembly				
Frequency	Connectors	Assembly Type No.	to 10 ft (3 m)	10-20 ft (3-6 m)	over 20 ft (6 m)	Bulk Cable Type No.	Bulk Cable Max. VSWR
1/4", 50 ohm, Superflexible							
5.85-6.425 GHz	N Plug/N Plug	**201083A**	1.30	1.35	1.35	**48659-7**	1.35
10.95-12.2 GHz	N Plug/N Plug	**201084A**	1.35	1.35	1.40	**48659-10**	1.40
	SMA Plug/SMA Plug	**207038**	1.35	1.35	1.40		
12.2-12.75 GHz	N Plug/N Plug	**201085**	1.40	1.45	1.45	**48659-11**	1.45
	SMA Plug/SMA Plug	**207039**	1.40	1.45	1.45		
14.0-14.5 GHz	N Plug/N Plug	**201085**	1.40	1.45	1.45	**48659-11**	1.45
	SMA Plug/SMA Plug	**207040**	1.40	1.45	1.45		
3/8", 50 ohm, Foam Dielectric							
5.85-6.425 GHz	N Plug/N Plug	**201074A**	1.25	1.30	1.35	**49774-2**	1.35
	N Plug/N Jack	**201075A**	1.25	1.30	1.35		
10.95-12.75 GHz	N Plug/N Plug	**201078A**	1.30	1.35	1.40	**49774-3**	1.40
	N Plug/N Jack	**201079A**	1.30	1.35	1.40		
1/2", 50 ohm, Foam Dielectric							
0.94-1.45 GHz	N Plug/N Plug	**43004A**	1.10	1.10	1.15*	**43818-42**	1.25
	N Plug/N Jack	**43005A**	1.10	1.10	1.15*		
3.625-4.2 GHz	N Plug/N Plug	**42125B**	1.20	1.20	1.30**	**43818-5**	1.35
	N Plug/N Jack	**42167B**	1.20	1.20	1.30**		
5.85-6.425 GHz	N Plug/N Plug	**42126B**	1.30	1.30	1.35†	**43818-6**	1.40
	N Plug/N Jack	**42168B**	1.30	1.30	1.35†		
1/2", 50 ohm, Superflexible							
0.94-1.45 GHz	N Plug/N Plug	**48363A**	1.15	1.20	1.25	**47869A-1**	1.25
	N Plug/N Jack	**48364A**	1.15	1.20	1.25		
3.625-4.2 GHz	N Plug/N Plug	**48367A**	1.25	1.30	1.35	**47869A-11**	1.35
	N Plug/N Jack	**48368A**	1.25	1.30	1.35		
5.85-6.425 GHz	N Plug/N Plug	**48369A**	1.40	1.40	1.40	**47869A-12**	1.40
	N Plug/N Jack	**48370A**	1.40	1.40	1.40		
7/8", 50 ohm, Foam Dielectric							
3.625-4.2 GHz	N Plug/N Plug	**207043**	1.20	1.25	1.25	**42150B-39**	1.25
	N Plug/N Jack	**207044**	1.20	1.25	1.25		
1/2", 50 ohm, Air Dielectric							
0.94-1.45 GHz	N Plug/N Plug	**207045**	1.20	1.20	1.25	**207032-1**	1.25
	N Plug/N Jack	**207046**	1.20	1.20	1.25		
3.625-4.2 GHz	N Plug/N Plug	**207047**	1.30	1.30	1.35	**207032-2**	1.35
	N Plug/N Jack	**207048**	1.30	1.30	1.35		
7/8", 50 ohm, Air Dielectric							
3.625-4.2 GHz	N Plug/N Plug	**207051**	1.15	1.20	1.20	**25831-2**	1.20
	N Plug/N Jack	**207052**	1.15	1.20	1.20		
1/4", 75 ohm, Superflexible							
52-88 MHz	N Plug/N Plug† †	**207053**	1.25	1.25	1.30	**207033-1**	1.30
	N Plug/N Jack† †	**207054**	1.25	1.25	1.30		
104-176 MHz	N Plug/N Plug† †	**207057**	1.25	1.25	1.30	**207033-2**	1.30
	N Plug/N Jack† †	**207058**	1.25	1.25	1.30		

*1.25 max VSWR for lengths over 100 ft (30 m).
**1.35 max VSWR for lengths over 100 ft (30 m).
†1.40 max VSWR for length over 100 ft (3 m).
† †70 ohm mating pin for N connector.

VSWR Characteristics

Frequency MHz	Standard Cable Typical VSWR	Low-VSWR Cable Maximum VSWR
54 – 216	1.10	1.05
470 – 740	1.12	1.08
740 – 806	1.15	1.10

HELIAX coaxial cables are ideal for broadcast applications. They are supplied in continuous lengths, permitting a one-piece installation, and their black polyethylene jacket makes them suitable for direct burial or installation in corrosive environments.

Low-VSWR HELIAX flexible coaxial cables are tested and selected for lowest VSWR over a specific 6 MHz television channel or radio frequency.

To Order. Specify cable type number and TV channel number or frequency.

HELIAX Coaxial Cables for Broadcast Applications

Television Channel No. (Frequency MHz)	Foam Dielectric Cables 7/8"	1-1/4"	1-5/8"	Air Dielectric Cables 7/8"	1-5/8"	3"	4"	5"
Standard Type No.:	LDF5-50A†	LDF6-50†	LDF7-50A†	HJ5-50†	HJ7-50A†	HJ8-50B†	HJ11-50†	HJ9-50†
Low VSWR Type No.:	—	—	—	—	42140†	42141†	42144†	42142†
Attenuation, dB/100 ft (dB/100 m)††								
AM (1)	0.035 (0.115)	0.026 (0.086)	0.021 (0.069)	0.035 (0.115)	0.020 (0.066)	0.013 (0.043)	0.010 (0.033)	0.007 (0.023)
2 (55.25)	0.271 (0.888)	0.201 (0.660)	0.164 (0.540)	0.274 (0.897)	0.153 (0.501)	0.103 (0.338)	0.082 (0.270)	0.057 (0.187)
6 (83.25)	0.335 (1.10)	0.250 (0.819)	0.204 (0.670)	0.337 (1.11)	0.188 (0.618)	0.127 (0.418)	0.102 (0.336)	0.071 (0.234)
FM (100)	0.37 (1.21)	0.275 (0.901)	0.225 (0.738)	0.37 (1.21)	0.207 (0.679)	0.14 (0.459)	0.113 (0.371)	0.079 (0.259)
7 (175.25)	0.498 (1.64)	0.370 (1.21)	0.305 (1.00)	0.502 (1.65)	0.272 (0.892)	0.194 (0.635)	0.154 (0.506)	0.107 (0.351)
13 (211.25)	0.551 (1.81)	0.409 (.134)	0.338 (1.11)	0.555 (1.82)	0.299 (0.980)	0.215 (0.705)	0.172 (0.563)	0.118 (0.389)
14 (471.25)	0.856 (2.81)	0.633 (2.08)	0.530 (1.74)	0.843 (2.77)	0.452 (1.52)	0.351 (1.15)	0.277 (0.910)	0.184 (0.605)
25 (537.25)	0.921 (3.03)	0.681 (2.23)	0.571 (1.87)	0.904 (2.97)	0.497 (1.63)	0.381 (1.25)	0.300 (0.984)	0.199 (0.652)
35 (597.25)	0.977 (3.21)	0.722 (2.37)	0.607 (1.99)	0.957 (3.14)	0.527 (1.73)	0.407 (1.34)	0.319 (1.05)	0.211 (0.693)
45 (657.25)	1.03 (3.38)	0.762 (2.50)	0.641 (2.10)	1.00 (3.30)	0.556 (1.82)	0.433 (1.42)	0.338 (1.11)	0.223 (0.732)
55 (717.25)	1.09 (3.55)	0.800 (2.63)	0.674 (2.21)	1.06 (3.46)	0.583 (1.91)	0.457 (1.50)	0.356 (1.17)	0.235 (0.770)
65 (777.25)	1.14 (3.72)	0.838 (2.75)	0.707 (2.31)	1.10 (3.62)	0.610 (2.00)	0.480 (1.58)	0.373 (1.22)	0.246 (0.807)
69 (801.25)	1.16 (3.79)	0.852 (2.80)	0.719 (2.36)	1.12 (3.68)	0.620 (2.03)	0.489 (1.60)	0.379 (1.24)	0.250 (0.821)
Average Power, kW Condition A (Condition B)‡								
AM (1)	44 —	90 —	143 —	44 (44)	145 (145)	320 (320)	490 (490)	765 (765)
2 (55.25)	7.35 —	12.7 —	18.3 —	8.73 (13.5)	19.6 (30.45)	51.1 (71.6)	77.6 (109.0)	101.0 (157.0)
6 (83.25)	5.93 —	10.2 —	14.8 —	7.05 (10.9)	15.9 (24.6)	40.9 (57.2)	62.0 (87.0)	80.8 (125.0)
FM (100)	5.4 —	9.3 —	13.4 —	6.40 (9.90)	14.4 (22.3)	37 (52)	56.0 (78.5)	73.0 (113.0)
7 (175.25)	4.00 —	6.90 —	9.91 —	4.71 (7.23)	10.7 (16.7)	27.0 (37.8)	41.5 (58.0)	54.5 (84.5)
13 (211.25)	3.62 —	6.24 —	8.94 —	4.27 (6.62)	9.72 (15.1)	24.2 (33.9)	37.5 (52.5)	49.5 (76.7)
14 (471.25)	2.33 —	4.03 —	5.70 —	2.78 (4.31)	6.41 (9.94)	15.1 (21.2)	23.4 (32.8)	31.8 (49.3)
25 (537.25)	2.17 —	3.74 —	5.29 —	2.60 (4.01)	5.97 (9.25)	13.9 (19.5)	21.7 (30.3)	29.4 (45.5)
35 (597.25)	2.04 —	3.53 —	4.98 —	2.45 (3.80)	5.64 (8.73)	13.0 (18.2)	20.3 (28.5)	27.5 (42.7)
45 (657.25)	1.94 —	3.35 —	4.72 —	2.32 (3.60)	5.34 (8.29)	12.3 (17.1)	19.2 (27.0)	26.0 (40.3)
55 (717.25)	1.84 —	3.19 —	4.49 —	2.21 (3.44)	5.10 (7.91)	11.6 (16.2)	18.3 (25.6)	24.6 (38.2)
65 (777.25)	1.76 —	3.04 —	4.28 —	2.12 (3.29)	4.90 (7.60)	11.0 (15.4)	17.4 (24.4)	23.4 (36.3)
69 (801.25)	1.73 —	2.99 —	4.20 —	2.09 (3.24)	4.82 (7.47)	10.8 (15.1)	17.1 (24.0)	23.0 (35.6)

†† Attenuation ratings based on VSWR = 1.0, ambient temperature 24°C (75°F).

† Specify TV channel number or frequency.

‡ Average power ratings based on:
For foam-dielectric cable, VSWR = 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F). For air-dielectric cables, VSWR = 1.0; ambient temperature, Condition A, 40°C (104°F), Condition B, 30°C (86°F); atmospheric pressure; dry air. For definition of Conditions A and B, see pages 214 and 215.

Phase-Stabilized Cable Applications

For certain applications, such as AM radio sampling lines, phased array radar, feeders and cables for Electronic Counter Measures (ECM) applications, cables with stable-phase temperature characteristics are required. Andrew LDF cables are excellent for these applications because of their very small phase change with temperature.

The cables on this page are special versions of HELIAX cables which have been stabilized by a temperature cycling process.

Andrew has the capability to provide cable assemblies cut to electrical length. Contact your local Andrew Sales Office listed inside the back cover for information on special applications.

Phase Stability

A coaxial cable expands with a rise in temperature causing the electrical length of the line to increase. The dielectric constant of the polyethylene dielectric decreases with a rise in temperature causing the electrical length to decrease. The interaction of these two parameters results in a phase temperature characteristic for a particular cable. This characteristic is expressed as parts per million change in electrical length per degree of temperature. The sign of the coefficient denotes a lengthening (+) or shortening (−) of the cable due to an increase in temperature. Typical phase-temperature coefficients for various cables are shown in the table.

These coefficients can be used to calculate the change in phase of a sampling line due to temperature changes. The formula for this is given below:

$$\text{Phase Change (Degrees)} = 3.66 \times 10^{-7}\ \text{PLTF/V}$$

Where: P = Phase Temperature Coefficient
L = Length of Cable, feet
T = Temperature Range
F = Frequency, MHz
V = Relative Velocity of Cable

Sample Calculation

Using the formula at left, the change in phase for a typical system operating at 1 MHz using a 500-foot run of HELIAX 3/8" LDF series foam dielectric cable (worst case is ±9 PPM/°C, from the table below) over a temperature range of −30 to +40°C (70°C total range) is illustrated below:

$$\text{Phase Change} = \frac{3.66 \times 10^{-7}\ (\pm 9) \times 500 \times 70 \times 1}{0.88}$$

$$= \pm 0.131 \text{ degrees}$$

Phase-Stabilized and Radio Sampling Lines

	1/4" Foam	3/8" Foam (LDF Series)	1/2" Foam (LDF Series)
Type Number, Phase Stabilized	**35422-11**	**35422-22**	**35422-14**
Type Number, Phase Stabilized and Cut to Equal Electrical Length	**42394-11**	**42394-22**	**42394-14**
Phase Temperature Coefficient, over temperature Range −30°C to +40°C (−22°F to +104°F)	−36 to −72 PPM/°C (−20 to −40 PPM/°F)	−9 to +9 PPM/°C (−5 to +5 PPM/°F)	−9 to +9 PPM/°C (−5 to +5 PPM/°F)
Characteristic Impedance, ohms	50	50	50
Velocity percent	79	88	88
Diameter over jacket, in (mm)	0.29 (7.4)	0.44 (11.2)	0.64 (16)
Cable Weight, lb/ft (kg/m)	0.07 (0.10)	0.08 (0.12)	0.16 (0.24)
Minimum Bending Radius, in (mm)	2.5 (63)	3.75 (95)	5 (125)
UHF Jack	**41U**	**L42U**	**L44U**
UHF Plug	**41P**	**L42P**	**L44P**
N Jack	**41N**	**L42N**	**L44N**
N Plug	**41W**	**L42W**	**L44W**
End Terminal	**13074A***	**13074A***	**L44T**

*Use with Type 41W or L42W.

HELIAX coaxial cables are ideal for use in cellular radio systems. The cables on this page are specially tested and selected for use in the 824-894 MHz band. Use of these cables assures optimum performance for cellular radio applications. Connectors, accessories, and all electrical and mechanical specifications for the similar standard cables apply. Reference pages are listed in the table.

HELIAX Coaxial Cables for 824-894 MHz

Cable Type	Foam Dielectric Cables				Air Dielectric Cables	
Nominal Size	1/2"	7/8"	1-1/4"	1-5/8"	7/8"	1-5/8"
Order Type Number	**43818-41**	**42150B-48**	**205360**	**42151A-18**	**25831-3**	**25816A-31**
Similar to Standard Cable	LDF4-50A	LDF5-50A	LDF6-50	LDF7-50A	HJ5-50	HJ7-50A
Attenuation, dB/100 ft (100 m)						
824 MHz	2.10 (6.90)	1.17 (3.85)	0.87 (2.84)	0.73 (2.40)	1.14 (3.75)	0.63 (2.07)
894 MHz	2.20 (7.22)	1.23 (4.03)	0.91 (2.98)	0.77 (2.52)	1.19 (3.92)	0.66 (2.16)
Reference Pages	226	228	230	230	234	236

HELIAX Jumper Cables for 824-894 MHz

Cable Type	Connectors	Length ft (m)	Attenuation at 890 MHz, dB	Type No.
For Antenna Connection				
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	3 (0.91)	0.1	**39816-100**
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	6 (1.82)	0.2	**39816-96**
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	10 (3.04)	0.3	**39816-97**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	3 (0.91)	0.1	**39818A-240**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	6 (1.82)	0.2	**39818A-241**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	10 (3.04)	0.4	**39818A-208**
7/8" Air Dielectric	7/8" EIA, 50 ohm/7/8" EIA, 50 ohm	7.33 (2.23)	0.1	**48148**
For Equipment Room Connection				
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	15 (4.57)	0.4	**39816-104**
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	20 (6.09)	0.5	**39816-105**
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	25 (7.62)	0.6	**39816-106**
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	30 (9.14)	0.7	**39816-107**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	15 (4.57)	0.5	**39818A-209**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	20 (6.09)	0.7	**39818A-210**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	25 (7.62)	0.9	**39818A-211**
1/2" Superflexible	N Plug (Male)/N Plug (Male)	30 (9.14)	1.0	**39818A-212**

HELIAX Low-VSWR Jumper Cable Assemblies are ideal for use as jumpers in Electronic Countermeasure (ECM) equipment, phased-array radar, and RF test equipment. Standard versions are typically used for two-way radio and microwave applications below 1427 MHz. Low-VSWR jumper assemblies for use in the 1427 – 2700 MHz microwave range are offered on page 240.

HELIAX Low-VSWR Jumper Cable. SMA connectors for 1/4" foam-dielectric cable have stainless steel bodies with gold-plated inner contact pins. Other 1/4", 3/8" and 1/2" LDF series low-VSWR foam-dielectric cable connectors have nickel-plated bodies and gold-plated inner contact pins.

HELIAX Superflexible Assemblies are recommended for applications where a combination of extreme flexibility and low loss are desired. The small minimum bend radius of HELIAX superflexible cable permits easy handling and routing in confined areas.

Phase-Stabilized HELIAX Assemblies. HELIAX foam-dielectric phase-stabilized cables have extremely low phase temperature coefficients which minimize phase changes due to temperature variation. When cut to equal electrical lengths, these cables will exhibit similar and repeatable phase characteristics. This product parameter makes HELIAX phase-stabilized cable assemblies the prime choice for phased-array radars.

Custom-made assemblies are available for special applications and for connector combinations not listed. To order custom-made assemblies, specify cable type, connector interface types, operating-band, maximum VSWR, and length in feet or metres. Also specify any other required characteristics such as electrical length, phase-matching, environmental conditions, special testing or marking. Contact your local Andrew Sales Office listed on the inside back cover for further information and assistance in specification preparation.

Standard HELIAX Jumper Cable Assemblies, 50 ohm

Connectors	Length ft (m)	Type No.
1/4" Superflexible Cable Assemblies		
Type N plug/Type N plug	8 (2.4)	**48100**
Type UHF plug/Type UHF plug	8 (2.4)	**48822**
1/2" Superflexible Cable Assemblies		
Type N plug/Type N plug	8 (2.4)	**49768A**
Type N plug/Type N plug	6 (1.8)	**201122**
Type N plug/Type N plug	3 (0.9)	**201124**
Type N plug/Type N jack	8 (2.4)	**49769A**
Type N plug/Type UHF plug	8 (2.4)	**49770A**
1/2" LDF Foam Cable Assemblies		
Type N plug/Type N plug	6 (1.8)	**43557-2**
Type N plug/Type N plug	3 (0.9)	**201123**
Type N plug/Type UHF plug	6 (1.8)	**43554-2**
Type N jack/Type UHF plug	6 (1.8)	**43660-2**
Type UHF plug/Type UHF plug	6 (1.8)	**43552-2**

Low-VSWR HELIAX Jumper Cable Assemblies, 50 ohm

Frequency GHz	Connectors	Type No.**	Maximum VSWR to 25 ft (8 metres)	Maximum VSWR 25 – 100 ft (8 – 30 metres)	Maximum VSWR over 100 ft (30 metres)
1/2" HELIAX LDF Foam Cable Assemblies					
0.3 – 1.7*	Type N plug/Type N plug	**43004A**	1.10	1.15	1.25
	Type N plug/Type N jack	**43005A**	1.10	1.15	1.25
1.7 – 2.3*	Type N plug/Type N plug	**41656B**	1.10	1.15	1.20
	Type N plug/Type N jack	**42166B**	1.10	1.15	1.20
2.3 – 4.2*	Type N plug/Type N plug	**42125B**	1.20	1.30	1.35
	Type N plug/Type N jack	**42167B**	1.20	1.30	1.35
3.7 – 8.0*	Type N plug/Type N plug	**42126B**	1.30	1.35	1.40
	Type N plug/Type N jack	**42168B**	1.30	1.35	1.40

*Specify operating frequency band.

**Specify length in feet or metres.

Low-VSWR HELIAX Jumper Cable Assemblies, 50 ohm

Frequency GHz	Connectors	Type No.**	Maximum VSWR to 10 ft (3 metres)	Maximum VSWR 10 – 20 ft (3 – 6 metres)	Maximum VSWR over 20 ft (6 metres)
1/2" HELIAX Superflexible Cable Assemblies					
0.3 – 1.7*	Type N plug/Type N plug	48363A	1.15	1.20	1.25
	Type N plug/Type N jack	48364A	1.15	1.20	1.25
1.7 – 2.3*	Type N plug/Type N plug	48365A	1.15	1.20	1.25
	Type N plug/Type N jack	48366A	1.15	1.20	1.25
2.3 – 4.2*	Type N plug/Type N plug	48367A	1.25	1.30	1.35
	Type N plug/Type N jack	48368A	1.25	1.30	1.35
4.2 – 7.1*	Type N plug/Type N plug	48369A	1.40	1.40	1.40
	Type N plug/Type N jack	48370A	1.40	1.40	1.40
3/8" HELIAX LDF Foam Cable Assemblies					
1.7 – 2.3*	Type N plug/Type N plug	201066	1.15	1.20	1.25
	Type N plug/Type N jack	201067	1.15	1.20	1.25
	Type TNC plug/Type TNC plug	201068	1.20	1.25	1.30
	Type TNC plug/Type TNC jack	201069	1.20	1.25	1.30
3.4 – 4.2*	Type N plug/Type N plug	201070	1.20	1.25	1.30
	Type N plug/Type N jack	201071	1.20	1.25	1.30
	Type TNC plug/Type TNC plug	201072	1.20	1.25	1.30
	Type TNC plug/Type TNC jack	201073	1.20	1.25	1.30
4.2 – 8.5*	Type N plug/Type N plug	201074A	1.25	1.30	1.35
	Type N plug/Type N jack	201075A	1.25	1.30	1.35
	Type TNC plug/Type TNC plug	201076A	1.25	1.30	1.35
	Type TNC plug/Type TNC jack	201077A	1.25	1.30	1.35
8.0 – 12.75*	Type N plug/Type N plug	201078A	1.30	1.35	1.40
	Type N plug/Type N jack	201079A	1.30	1.35	1.40
	Type TNC plug/Type TNC plug	201080A	1.30	1.35	1.40
	Type TNC plug/Type TNC jack	201081A	1.30	1.35	1.40
1/4" HELIAX Foam Cable Assemblies					
0.3 – 4.2*	Type N plug/Type N plug	42169B	1.20	1.30	1.40
	Type N plug/Type N jack	42172B	1.20	1.30	1.40
	Type N plug/Type TNC plug	42175B	1.20	1.30	1.40
	Type TNC plug/Type TNC plug	42178B	1.20	1.30	1.40
	Type TNC plug/Type TNC jack	42182B	1.20	1.30	1.40
4.0 – 8.5*	Type N plug/Type N plug	42170B	1.25	1.35	1.40
	Type N plug/Type N jack	42173B	1.25	1.35	1.40
	Type N plug/Type TNC plug	42176B	1.25	1.35	1.40
	Type TNC plug/Type TNC plug	42179B	1.25	1.35	1.40
	Type TNC plug/Type TNC jack	42183B	1.25	1.35	1.40
8.0 – 12.75*	Type N plug/Type N plug	42171B	1.30	1.40	1.45
	Type N plug/Type N jack	42174B	1.30	1.40	1.45
	Type N plug/Type TNC plug	42188B	1.30	1.40	1.45
	Type TNC plug/Type TNC plug	42180B	1.30	1.40	1.45
	Type TNC plug/Type TNC jack	42184B	1.30	1.40	1.45
12.0 – 16.0*	Type TNC plug/Type TNC plug	42579A	1.40	1.45	1.45
	Type TNC plug/Type TNC jack	42580A	1.40	1.45	1.45
10.95 – 18.0*	Type SMA plug/Type SMA plug	42962A	1.40	1.45	1.45
	Type SMA plug/Type SMA jack	42963A	1.40	1.45	1.45
1/4" HELIAX Superflexible Cable Assemblies					
0.3 – 4.2*	Type N plug/Type N plug	201082A	1.25	1.30	1.35
4.0 – 8.5*	Type N plug/Type N plug	201083A	1.30	1.35	1.35
8.0 – 12.2*	Type N plug/Type N plug	201084A	1.35	1.35	1.40
12.0 – 18.0*	Type N plug/Type N plug	201085	1.40	1.45	1.45

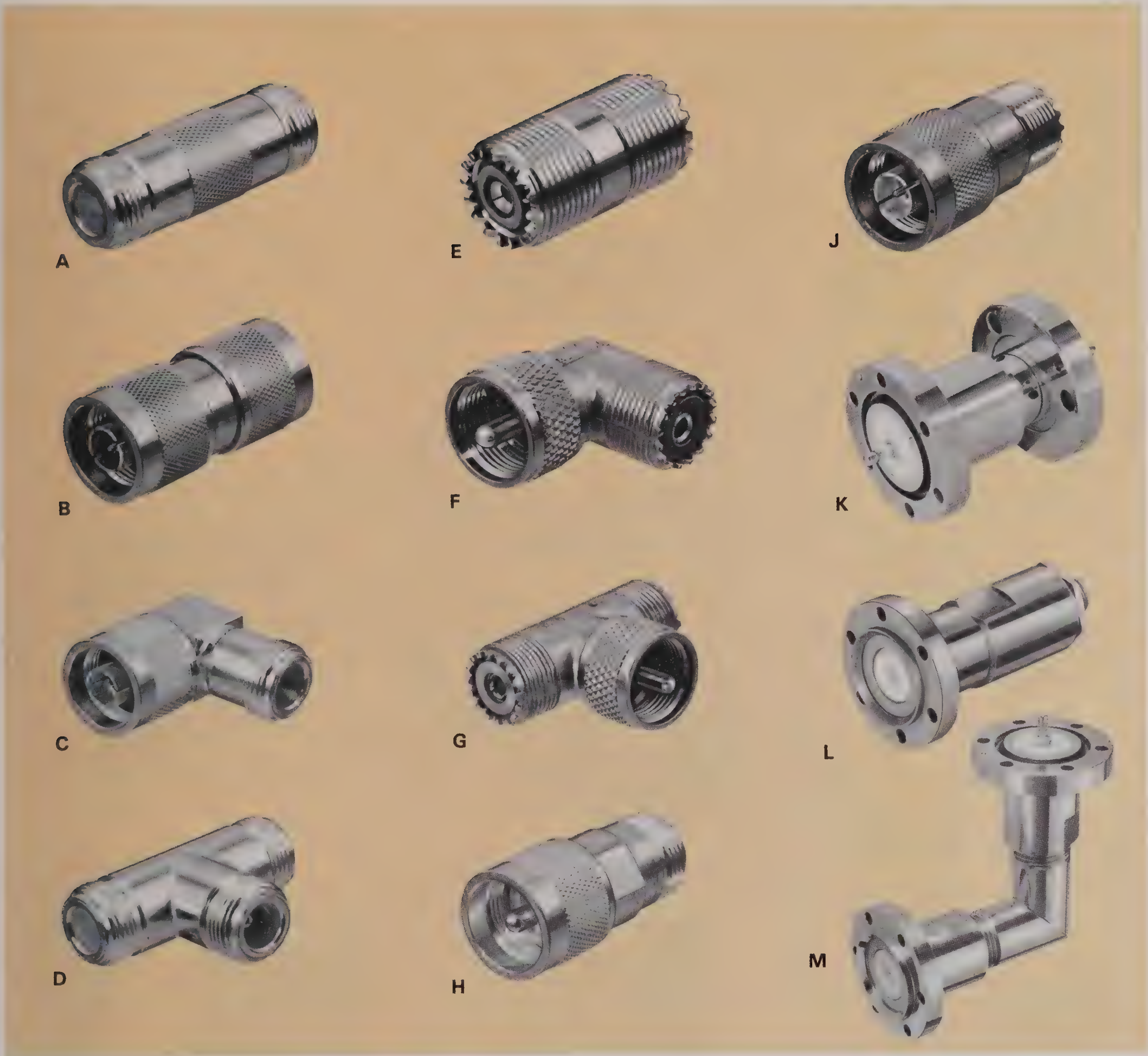
*Specify operating frequency band.

**Specify length in feet or metres.

Dimensions and Weights

Type Number	Length in (mm)	Body Dia. in (mm)	Flange Dia. in (mm)	Weight lb (kg)
41EN	1.70 (43.2)	0.88 (22.4)	—	0.3 (0.14)
41ENS	1.00 (25.4)	0.40 (10.2)	—	0.3 (0.14)
41ENT	1.54 (39.1)	0.56 (14.3)*	—	0.3 (0.14)
41EW	1.60 (40.6)	0.56 (14.3)*	—	0.3 (0.14)
41EWS	0.94 (23.9)	—	—	0.3 (0.14)
41EWT	0.68 (17.3)	0.56 (14.3)*	—	0.3 (0.14)
41N	1.02 (25.8)	0.69 (17.5)*	—	0.3 (0.14)
41P	1.77 (44.9)	0.69 (17.5)*	—	0.3 (0.14)
41SEW	1.22 (31.0)	0.69 (17.5)*	—	0.3 (0.14)
41SJ	2.39 (60.7)	0.84 (21.3)	—	0.4 (0.2)
41SN-70	1.94 (49.3)	0.69 (17.5)	—	0.3 (0.14)
41SNS	1.00 (25.4)	0.40 (10.2)	—	0.3 (0.14)
41SP	1.50 (38.1)	0.72 (18.3)	—	0.3 (0.14)
41SW	—	0.44 (11.1)*	—	0.3 (0.14)
41SW-70	2.33 (59.2)	0.69 (17.5)	—	0.3 (0.14)
41SWS	0.94 (23.9)	0.40 (10.2)	—	0.3 (0.14)
41SWT	—	0.44 (11.1)*	—	0.3 (0.14)
41SWT-75	1.20 (30.5)	0.66 (16.8)	—	0.3 (0.14)
41U	1.97 (50.0)	0.69 (17.5)*	—	0.3 (0.14)
41W	1.70 (43.3)	0.69 (17.5)*	—	0.3 (0.14)
L42N	2.35 (59.7)	0.63 (15.9)	—	0.3 (0.14)
L42NT	1.90 (48.3)	0.63 (15.9)	—	0.3 (0.14)
L42P	2.25 (57.2)	0.63 (15.9)	—	0.3 (0.14)
L42U	2.32 (58.9)	0.91 (23.0)	—	0.3 (0.14)
L42W	2.01 (51.1)	0.63 (15.9)	—	0.3 (0.14)
L42WT	2.05 (52.1)	0.63 (15.9)	—	0.3 (0.14)
44ASGR	3.48 (88.4)	1.00 (25.4)	—	04. (0.2)
44ASJ	2.39 (60.7)	0.84 (21.3)	—	0.4 (0.2)
44ASN	2.10 (53.3)	0.84 (21.3)	—	0.4 (0.2)
44ASP	2.25 (57.2)	0.84 (21.3)	—	0.4 (0.2)
44ASR	3.25 (82.6)	1.35 (34.3)	2.25 (57.2)	0.4 (0.2)
44ASU	2.16 (54.9)	0.84 (21.3)	—	0.4 (0.2)
44ASW	2.20 (55.9)	0.84 (21.3)	—	0.4 (0.2)
L44DF	2.69 (68.3)	1.14 (29.0)	—	0.4 (0.2)
L44DM	2.56 (65.0)	—	1.50 (38.0)	0.4 (0.2)
L44EN	2.51 (63.8)	0.91 (23.0)	—	0.4 (0.2)
L44EW	2.45 (62.2)	0.91 (23.0)	—	0.4 (0.2)
L44F	2.28 (57.9)	0.91 (23.0)	2.25 (57.2)	0.4 (0.2)
L44J	2.50 (63.5)	0.91 (23.0)	—	0.4 (0.2)
L44M	3.55 (90.2)	0.91 (23.0)	—	0.4 (0.2)
L44N	2.51 (63.8)	0.91 (23.0)	—	0.4 (0.2)
L44N-70	2.51 (63.8)	0.91 (23.0)	—	0.4 (0.2)
L44N-75	2.51 (63.8)	0.91 (23.0)	—	0.4 (0.2)
L44P	2.25 (57.2)	0.91 (23.0)	—	0.4 (0.2)
L44P-75	2.25 (57.2)	0.91 (23.0)	—	0.4 (0.2)
L44R	3.21 (86.6)	0.91 (23.0)	2.25 (57.2)	0.4 (0.2)
L44T	4.00 (101.6)	0.91 (23.0)	—	0.4 (0.2)
L44U	2.32 (58.9)	0.91 (23.0)	—	0.4 (0.2)
L44U-75	2.32 (58.9)	0.91 (23.0)	—	0.4 (0.2)
L44W	2.45 (62.2)	0.91 (23.0)	—	0.4 (0.2)
L44W-70	2.45 (62.2)	0.91 (23.0)	—	0.4 (0.2)
L44W-75	2.45 (62.2)	0.91 (23.0)	—	0.4 (0.2)
L44Z	3.17 (80.5)	1.09 (27.7)	—	0.4 (0.2)
45AN-75	1.90 (48.3)	1.38 (35.1)	—	1.5 (0.7)
L45DF	2.72 (69.1)	1.36 (34.5)	—	1.5 (0.7)
L45DM	2.63 (66.7)	1.38 (35.1)	—	1.5 (0.7)
L45F	1.76 (44.7)	1.40 (35.6)	2.25 (57.2)	1.5 (0.7)
L45J	2.95 (74.9)	1.34 (34.0)	—	1.5 (0.7)
L45L	3.42 (86.8)	1.35 (34.3)	—	1.5 (0.7)
L45M	3.69 (93.7)	1.34 (34.0)	—	1.5 (0.7)
L45N	2.80 (71.1)	1.35 (34.3)	—	1.5 (0.7)
L45P	2.70 (68.5)	1.35 (34.3)	—	1.5 (0.7)
L45R	3.32 (84.3)	1.35 (34.3)	2.25 (57.2)	1.5 (0.7)
L45T	4.88 (123.8)	1.35 (34.3)	—	1.5 (0.7)
L45U	2.68 (68.1)	1.35 (34.3)	—	1.5 (0.7)
L45W	2.83 (71.9)	1.37 (34.8)	—	1.5 (0.7)
L45Z	3.34 (84.8)	1.47 (37.3)	—	1.5 (0.7)
L46DF	4.08 (103.6)	2.03 (51.6)	—	1.5 (0.7)
L46DM	3.91 (99.3)	2.03 (51.6)	—	1.5 (0.7)
L46F	4.00 (101.6)	2.03 (51.6)	2.25 (57.2)	1.5 (0.7)
L46L	4.70 (119.4)	2.03 (51.6)	—	1.5 (0.7)
L46M	4.86 (123.4)	2.03 (51.6)	—	1.5 (0.7)
L46N	3.70 (94.0)	2.03 (51.6)	—	1.5 (0.7)
L46R	5.08 (129.0)	2.03 (51.6)	3.50 (88.9)	1.5 (0.7)
L46S	4.64 (117.9)	2.03 (51.6)	2.25 (57.2)	1.5 (0.7)
L46W	3.81 (96.8)	2.03 (51.6)	—	1.5 (0.7)
L46Z	3.00 (76.2)	2.09 (53.1)	—	1.5 (0.7)
L47L	4.80 (122.0)	2.38 (60.5)	—	4.5 (2.0)
L47DF	5.30 (135.0)	2.38 (60.5)	—	4.5 (2.0)
L47DM	5.30 (135.0)	2.38 (60.5)	—	4.5 (2.0)
L47F	5.88 (149.4)	2.38 (60.5)	2.25 (57.2)	4.5 (2.0)
L47M	5.30 (135.0)	2.38 (60.5)	—	4.5 (2.0)
L47N	4.80 (122.0)	2.38 (60.5)	—	4.5 (2.0)
L47S	5.10 (130.0)	2.38 (60.5)	2.25 (57.2)	4.5 (2.0)
L47R	5.10 (130.0)	2.38 (60.5)	3.50 (88.9)	4.5 (2.0)
L47Z	5.10 (130.0)	2.90 (73.7)	—	4.5 (2.0)
74AN	2.81 (71.5)	1.00 (25.4)	—	0.4 (0.2)
74AW	2.83 (71.8)	1.00 (25.4)	—	0.4 (0.2)
74T	4.56 (115.8)	0.88 (22.4)	—	0.4 (0.2)
74U	2.83 (71.8)	1.00 (25.4)	—	0.4 (0.2)
74Z	4.94 (125.5)	1.13 (28.7)	—	0.4 (0.2)
75AG	3.66 (93.0)	1.38 (35.1)	2.25 (57.2)	1.5 (0.7)
75AM	4.97 (126.2)	1.38 (35.1)	—	1.5 (0.7)
75AN	3.41 (86.6)	1.38 (35.1)	—	1.5 (0.7)
75AN-75	3.93 (100.0)	1.38 (35.1)	—	1.5 (0.7)
75AR	3.66 (93.0)	1.38 (35.1)	2.25 (57.2)	1.5 (0.7)
75AR-75	4.28 (108.7)	1.38 (35.1)	2.25 (57.2)	1.5 (0.7)
75AT	5.09 (129.3)	1.38 (35.1)	—	1.5 (0.7)
75AT-75	5.75 (146.0)	1.38 (35.1)	—	1.5 (0.7)
75AU	3.38 (85.9)	1.38 (35.1)	—	1.5 (0.7)
75AU-75	4.28 (108.7)	1.38 (35.1)	—	1.5 (0.7)
75AW	3.50 (88.9)	1.38 (35.1)	—	1.5 (0.7)
75AW-75	3.50 (88.9)	1.38 (35.1)	—	1.5 (0.7)
75AZ	4.23 (107.4)	1.38 (35.1)	—	1.5 (0.7)
75AZ-75	4.23 (107.4)	1.38 (35.1)	—	1.5 (0.7)
75DM	2.84 (72.1)	1.38 (35.1)	—	1.5 (0.7)
77AN-75	4.13 (105.0)	2.38 (60.5)	—	4.5 (2.0)
77AR-75	4.84 (123.0)	2.38 (60.5)	3.50 (88.9)	4.5 (2.0)
77AZ-75	5.88 (149.0)	2.38 (60.5)	—	4.5 (2.0)
78AGF	5.09 (129.4)	3.63 (92.1)	5.19 (131.8)	8.0 (3.6)
78AGM	4.44 (112.7)	3.63 (92.1)	5.19 (131.8)	8.0 (3.6)
78ARF	5.09 (129.4)	3.63 (92.1)	5.19 (131.8)	8.0 (3.6)
78ARM	4.44 (112.7)	3.63 (92.1)	5.19 (131.8)	8.0 (3.6)
78AS	3.88 (98.4)	3.63 (92.1)	3.50 (88.9)	8.0 (3.6)
78BZ	6.13 (155.6)	5.31 (134.9)	—	8.0 (3.6)
79AZ	6.19 (157.2)	7.57 (192.2)	—	19.0 (8.6)
79G	5.56 (141.3)	8.13 (206.4)	8.13 (206.4)	19.0 (8.6)
79R	5.56 (141.3)	8.13 (206.4)	8.13 (206.4)	19.0 (8.6)
81GF	6.00 (152.0)	4.75 (121.0)	5.19 (131.8)	15.0 (6.8)
81RF	6.00 (152.0)	4.75 (121.0)	5.19 (131.8)	15.0 (6.8)
81Z	7.00 (178.0)	6.00 (152.0)	—	15.0 (6.8)
87G	5.66 (143.8)	2.38 (60.5)	3.50 (88.9)	4.5 (2.0)
87L	4.94 (125.5)	2.38 (60.5)	—	4.5 (2.0)
87N	4.13 (105.0)	2.38 (60.5)	—	4.5 (2.0)
87R	4.84 (123.0)	2.38 (60.5)	3.50 (88.9)	4.5 (2.0)
87S	5.63 (143.0)	2.38 (60.5)	2.25 (57.2)	4.5 (2.0)
87SG	5.63 (143.0)	2.38 (60.5)	2.25 (57.2)	4.5 (2.0)
87T	7.00 (178.0)	2.38 (60.5)	—	4.5 (2.0)
87Z	5.88 (149.0)	2.38 (60.5)	—	4.5 (2.0)
42826	8.28 (210.3)	—	8.13 (206.4)	15.0 (6.8)
42896	8.28 (210.3)	—	8.13 (206.4)	15.0 (6.8)
43716	2.76 (70.0)	0.91 (23.0)	—	0.4 (0.2)
48070	1.97 (50.0)	0.91 (23.0)	—	0.4 (0.2)
49600	2.78 (70.6)	0.84 (21.3)	—	0.5 (0.3)
49600-75	2.78 (70.6)	0.84 (21.3)	—	0.5 (0.3)
120810-1	2.17 (55.0)	0.63 (16.0)	—	0.16 (.352)
124800-1	3.94 (100.0)	1.34 (34.0)	2.28 (58.0)	0.85 (1.87)
124990-1	3.00 (75.0)	0.91 (23.0)	2.28 (58.0)	0.55 (0.25)
201942	5.42 (137.7)	2.38 (60.5)	2.25 (57.2)	4.5 (2.0)
206161	3.20 (81.3)	0.94 (23.9)	—	0.5 (0.3)

*Across flats of hex.



RF Connector Adaptors

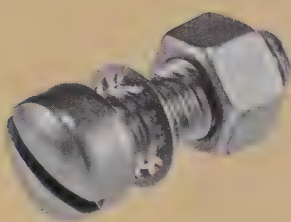
	Description	Type No.
A	Type N Junction, female both ends, UG-29B/U	10804-11
B	Type N Junction, male both ends, UG-57B/U	10804-9
C	Type N Right Angle, male-female, UG-27D/U	10804-66
D	Type N Tee, female-female-female, UG-28A/U	10804-17
E	UHF Junction, female both ends, PL-258	10805-6
F	UHF Right Angle, male-female, M-359A	10805-5
G	UHF Tee, female-male-female, M-358	10805-4
H	Type N Jack (female), UHF Plug (male) Adaptor	10805-12
J	Type N Plug (male), UHF Jack (female) Adaptor	10805-11
K	"F" Flange (male), 7/8" EIA, 50 ohm Flange Adaptor	33682
L	"F" Flange (female), Type N Jack (female) Adaptor	104300-2
M	"F" Flange Elbow, "F" Flange (male), "F" Flange (female)	203361

A

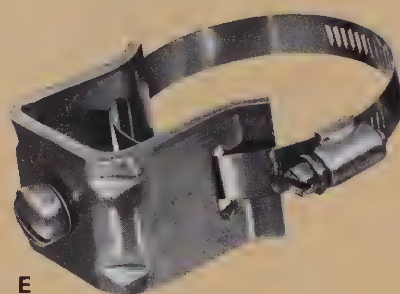
C

F

D



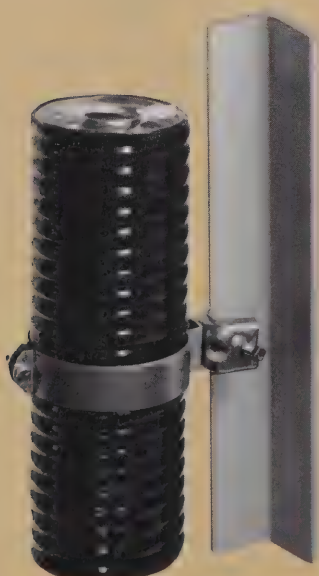
B



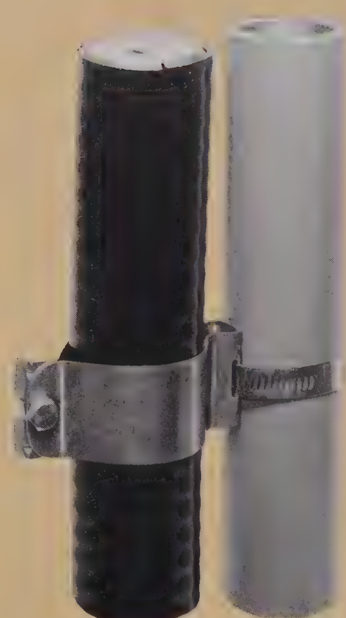
E

G

Typical Hanger Applications



Attachment of Cable to Angle Tower Member using Hanger and Angle Adaptor.



Attachment of Cable to Round Tower Member using Hanger and Round Member Adaptor.

Attachment of Cable to Round Tower Member using Hanger and Tower Standoff Kit.

Standard Hangers and Adaptors for 1/2" to 4" Cables

Hangers for 1/2" to 4" HELIAX cables use 3/8" hardware for attachment to towers or adaptors.

A Hanger Kit of 10 pieces. Stainless steel. 3/8" mounting hardware not included.

Cable Size	Maximum Spacing	Type Number
1/2"	3 ft (1 m)	**43211**
7/8"	3 ft (1 m)	**42396A-5**
1-1/4"	3 ft (1 m)	**42396A-1**
1-5/8"	3 ft (1 m)	**42396A-2**
3"	5 ft (1.5 m)	**31766-11**
4"	5 ft (1.5 m)	**31766-10**

B Hardware Kit of 10 pieces. 3/8" fillister-head bolts, lock washers and nuts for attachment of hangers to drilled tower members.
3/4 in (19 mm) long . . . . Type **31769-5**
1 in (25 mm) long . . . . Type **31769-1**

C Angle Adaptor Kit of 10 pieces. Stainless Steel. For mounting 1/2" to 4" cable hangers to angle tower members up to 7/8 in (22 mm) thick. Includes hanger attachment hardware . . . . Type **31768A**

D Round Member Adaptor Kit of 10 pieces. Stainless steel clamps to mount 1/2" to 4" cable hangers to round support members. Two each are needed for 3" and 4" cable hangers.

Member Diameter, in (mm)	Type No.
1 – 2 (25 – 50)	**31670-1**
2 – 3 (50 – 75)	**31670-2**
3 – 4 (75 – 100)	**31670-3**
4 – 5 (100 – 125)	**31670-4**
5 – 6 (125 – 150)	**31670-5**

E Tower Standoff Kit of 10 pieces. Adaptors with round member clamps and hardware for 1/2" to 4" hangers. All parts are stainless steel or galvanized.

Member Diameter in (mm)	1 in (25 mm) Standoff	2.5 in (60 mm) Standoff
0.75 – 1.5 (20 – 40)	**30848-5**	—
1.5 – 3.0 (40 – 75)	**30848-4**	—
3 – 4 (75 – 100)	**30848-1**	**41108A-1**
4 – 5 (100 – 125)	**30848-2**	**41108A-2**
5 – 6 (125 – 150)	**30848-3**	**41108A-3**

F Threaded Rod Support Kit Use to mount hangers away from supporting structure, under cable bridge and inside equipment room. Includes 3/8" diameter threaded rod, galvanized ceiling mounting plate, nuts and washers. Attach to angle tower members with 31768A angle adaptors. Attach to round tower members with 30848 series tower standoffs. All components are stainless steel, except ceiling mounting plate.

Rod Length, in (mm)	Kit of 1	Kit of 5
12 (305)	**31771**	**31771-4**
24 (610)	**31771-9**	**31771-6**

G Snap-In Hanger Kit of 10 pieces. Mounts to prepunched 3/4" (19 mm) holes on Andrew self-supporting towers or, when used with adaptors, to any tower. Guyed tower transmission support systems can also accommodate snap-in hanger when specified. Made of heavy gauge stainless steel.
1/2" cable . . . . Type **206706-1**
7/8" cable . . . . Type **206706-2**
1-1/4" cable . . . . Type **206706-3**
1-5/8" cable . . . . Type **206706-4**

Standard Hangers and Adaptors for 5" Cables

Hangers for 5" HELIAX cables use 1/2" hardware for attachment to towers or adaptors.

A Hanger Kit of 10 pieces. Galvanized steel. 1/2" mounting hardware not included. Maximum spacing 5 ft (1.5 m) . . . . Type **33598-5**

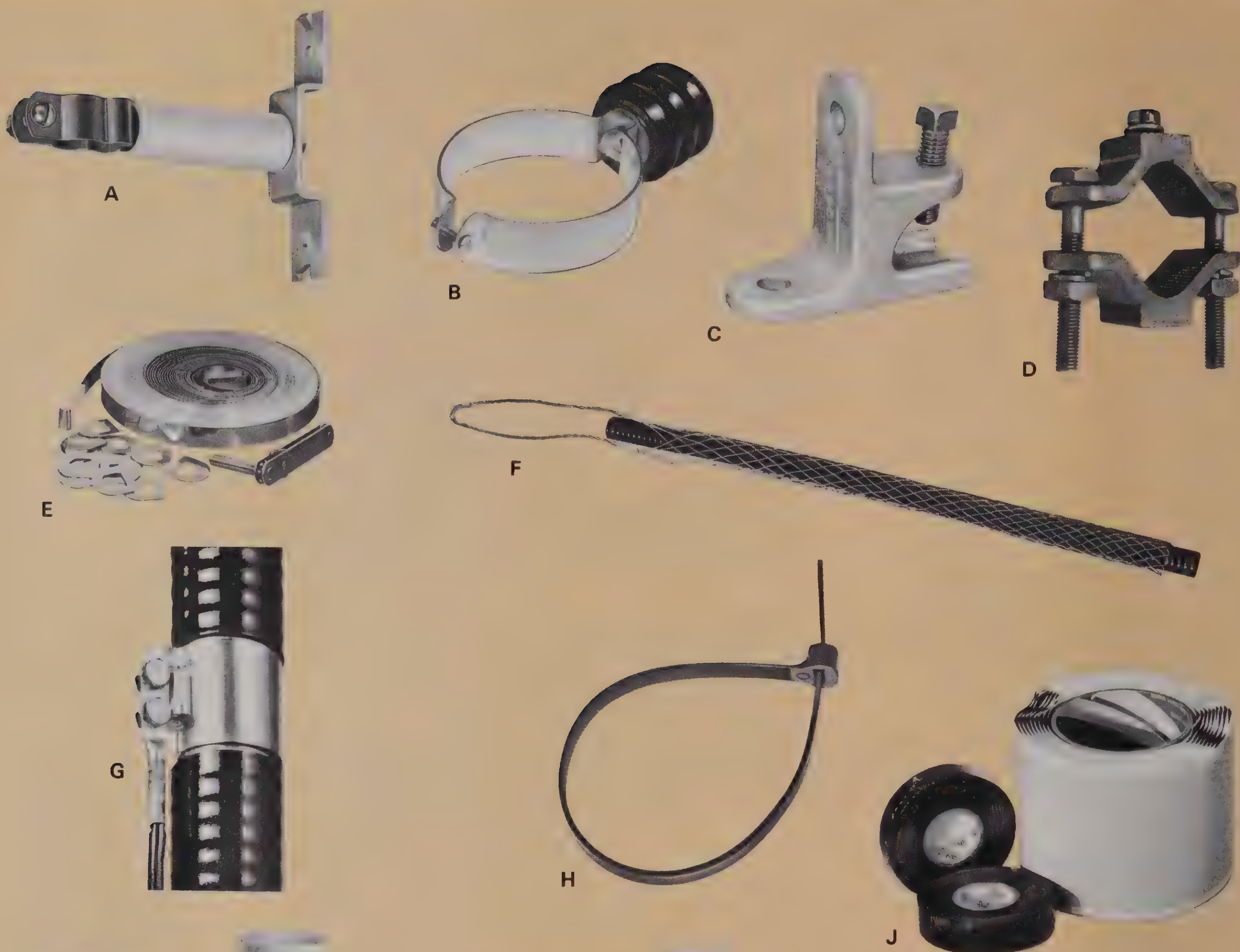
B Hardware Kit of 10 pieces. 1/2" x 1-1/4" (32 mm) bolts, lock washers and nuts for attachment of 5" hangers to drilled tower members . . . . Type **31769-4**

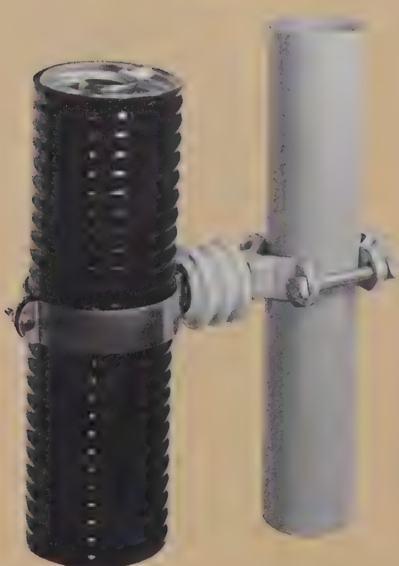
C Angle Adaptor Kit of 10 pieces. Stainless steel. For mounting 5" cable hangers to angle tower members up to 7/8" (22 mm) thick . . . . Type **33981A-1**

E Round Member Adaptor/Tower Standoff Kit of 10 pieces. For mounting 5" cable hangers to round support members. Permits HELIAX cable to clear tower leg flanges. Provides 2.5 in (60 mm) standoff. All parts are stainless steel or galvanized.

Member Diameter, in (mm)	Type No.
3 – 4 (75 – 100)	**43130-1**
4 – 5 (100 – 125)	**43130-2**
5 – 6 (125 – 150)	**43130-3**

F Threaded Rod Support Kit of 5 pieces. 1/2" x 12 in (305 mm) threaded rods, galvanized ceiling mounting plates, nuts and washers for suspending 5" cable hangers. All parts are stainless steel except ceiling mounting plate . . . . Type **31771-5**





Insulated Hanger
Attached to
Round Tower Member

Insulated Hanger
Attached to
Angle Tower Member

K

Insulated Hangers and Adaptors

A Insulated Hanger for 1/4" to 7/8" Cables Single. For use on insulated tower. Maximum spacing 3 ft (1 m).
For 1/4", 3/8" and 1/2" cables .... Type **11662-3**
For 7/8" cable .... Type **11662-2**

B Insulated Hanger for 1-1/4" – 5" Cables Single. For use on insulated tower.

Cable Size	Max. Spacing	Type No.
1-1/4"	3 ft (1 m)	**33948-5**
1-5/8"	3 ft (1 m)	**33948-3**
3"	5 ft (1.5 m)	**33948-2**
4"	5 ft (1.5 m)	**33948-4**
5"	5 ft (1.5 m)	**33948-1**

C Angle Adaptor Single. For insulated hangers. Maximum member thickness 7/8" (22 mm).
For 1/2" and 7/8" cable .... Type **40430-1**
For 1-5/8" – 5" cable .... Type **13555A**

D Round Member Adaptor Single. For use with Type 33948 series (1-1/4" – 5" cables) insulated hangers. Fits member diameters 1 – 3 in (25 – 75 mm) .... Type **13550**

E Stainless Steel Wraplock 100 feet complete with fasteners. Use to attach 1/4" – 7/8" insulated hangers to round members. **Not to be used to attach cable or waveguide directly to towers** .... Type **12395-1**

Other Accessories

Connector Reattachment Kit includes rubber gasket parts (except flange gaskets) to replace those which may be damaged during disassembly and subsequent reattachment of connectors.

Cable Types	For Connector Types	Reattachment Kit Type No.
Foam-Dielectric Cables		
LDF2-50	L42 Series	**34767A-38**
LDF4-50A	L44 Series	**34767A-27**
FSJ4-50B	44AS Series	**34767A-39**
LDF5-50A	L45 Series	**34767A-28**
LDF6-50	L46 Series	**34767A-43**
LDF7-50A	L47 Series	**34767A-35**
Air-Dielectric Cables		
HJ4-50	74AN, 74AW	**34767A-22**
HJ5-50	75AN, 75AR, 75AW	**34767A-3**
	75AG, 75AU,	**34767A-5**
	75RT, 75GT	**34767A-36**
HJ7-50A	87G, 87R	**34767A-6**
	87N, 87S, 87SG	**34767A-7**
	87SGT, 87ST	**34767A-20**
	87NT, 87WT	**34767A-19**
	87Z	**34767A-13**
HJ8-50B	78AGF, 78AGM,	
	78ARF, 78ARM,	
	78AS	**34767A-10**
	78BZ	**34767A-30**
HJ11-50	81RF	**34767A-15**
	81GF	**34767A-16**
	81Z	**34767A-17**
HJ9-50	79G, 79R	**34767A-8**
	79AZ	**34767A-31**

F Hoisting Grip. Use at 200 ft (60 m) intervals to raise cable on tower.

Cable Size	Type No.
1/2"	**43094**
7/8"	**19256B**
1-1/4"	**24312A**
1-5/8"	**24312A**
3"	**26985A**
4"	**34759**
5"	**31031-1**

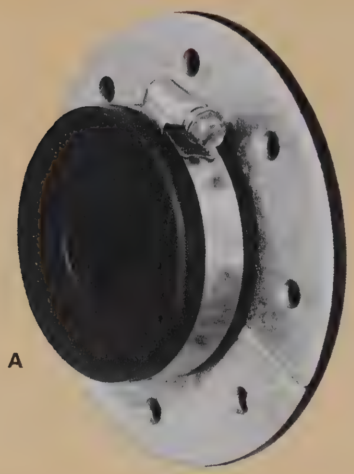
G Grounding Strap Kit. Used to ground cable to tower. Solid copper non-braided strap comes preassembled with grounding cable and connecting hardware.

Cable Size	Type No.
1/2"	**204989-1**
7/8"	**204989-2**
1-1/4"	**204989-3**
1-5/8"	**204989-4**
3"	**204989-5**
4"	**204989-6**
5"	**204989-7**

H Nylon Cable Tie Kit of 50 pieces. Weather resistant straps for attaching 1/4" to 7/8" cables directly to tower members. Maximum spacing 3 ft (1 m) ... Type **40417**

J Connector Burial Kit. Includes waterproofing tape and electrical tape for protection of underground splices. Kit will cover two 5" or 4", three 3", four 1-5/8", six 7/8" or ten 1/2" splices .... Type **34283**

K Bulkhead Adaptor. For use with type N or UHF jacks for 1/4", 3/8", 1/2" or 7/8" HELIAX cable. Includes faceplate and mounting hardware .... Type **26016-2**



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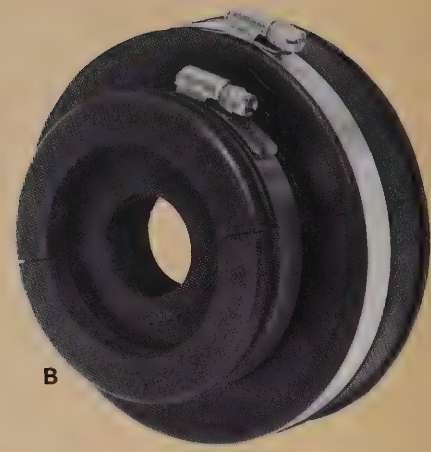

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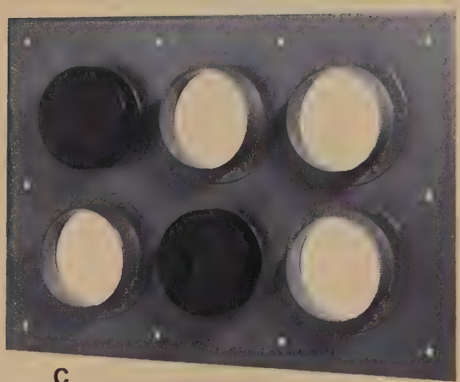

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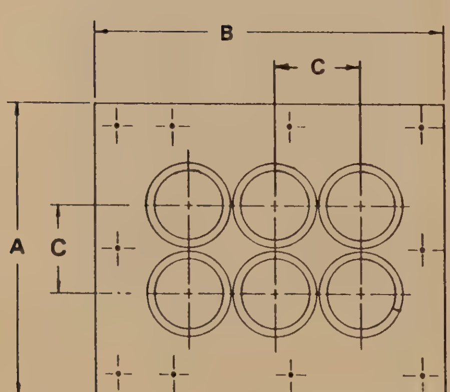


A Single Entrance Wall/Roof Feed-Thru Assembly. Includes rubber boot, clamp and galvanized steel plate. Order from table.

B Multiple Entrance Wall/Roof Feed-Thru Plate. Use with 204679 (4 inch) or 48939 (5 inch) series cable boots.

C Cable Boot. Use with 204673 (4 inch) or 48940 (5 inch) series feed-thru plate.

Wall/Roof Feed Thru and Cable Boots

Cable Size	Wall/Roof Feed Thru Assembly, Single Entrance	Cable Boot (For Plates Below) 4 in (102 mm) Diameter	5 in (127 mm) Diameter
1/2″	40656-3	204679-1	48939-5
7/8″	40656-3	204679-2	48939-1
7/8″	One, Two or Three Runs	—	48939-2
1-1/4″	40656-5	204679-3	48939-3
1-5/8″	40656-2	204679-4	48939-4
3″	40394-2	—	—
4″	40394-1	—	—
5″	33938-5	—	—

Multiple Entrance Wall/Roof Feed-Thru Plate

Number of Openings	Dimen. A in (mm)	Dimen. B in (mm)	Dimen. C in (mm)	Type
4 in (102 mm) Diameter Entry Opening				
1	7 (178)	7 (178)	—	204673-1
1	5 (127)	5 (127)	—	204673-2
4	9 (229)	25.5 (648)	—	204673-4
8	17.5 (444)	25.5 (648)	5.12 (130)	204673-8
5 in (127 mm) Diameter Entry Opening				
1	9.5 (241)	9.5 (241)	—	48940-1
2	9.5 (241)	17.5 (444)	7 (178)	48940-2
3	9.5 (241)	25.5 (648)	7 (178)	48940-3
4	17.5 (444)	17.5 (444)	7 (178)	48940-4
6	17.5 (444)	25.5 (648)	7 (178)	48940-6

Hoisting and Vertical Run

A pulley and line are recommended for lifting HELIAX cable. Line size and lifting power requirements depend upon line length and cable size (see mechanical characteristics tables for cable weights). The hoist line should be long enough to allow periodic attachment to the cable along the vertical run during hoisting. Cable grips are used to support the cable weight on the hoisting line and may be fastened to the tower as permanent supports.

The reel should be supported on an axle to permit free rotation as the cable is being hoisted. The method illustrated (cable pays off the top) is the safest for use with heavily-loaded reels. For lightly-loaded reels, less than 1000 lb (450 kg) gross weight, which can be braked by hand, it is sometimes more convenient to rotate the reel 180° from the position shown and pull the cable from the bottom of the reel.

A protective covering should be placed over the connector to prevent damage during hoisting. The cable should be hoisted slowly and rotation of the reel should be retarded to control payout of the cable.

Cable hangers are used to support the cable on the tower. Maximum spacing is 3 ft (1 m) for 1-5/8" and smaller cables; 5 ft (1.5 m) for 3" and larger cables.

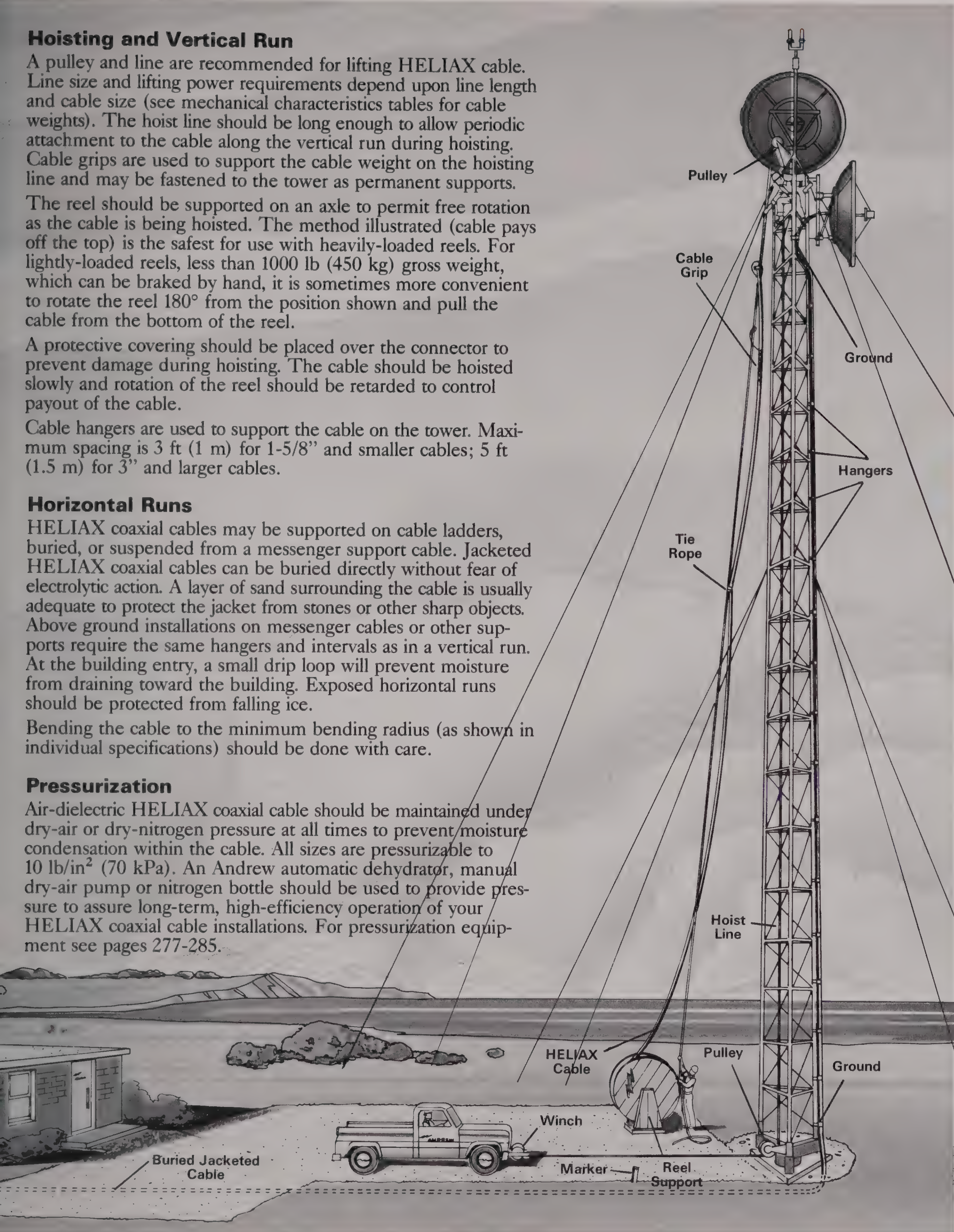
Horizontal Runs

HELIAX coaxial cables may be supported on cable ladders, buried, or suspended from a messenger support cable. Jacketed HELIAX coaxial cables can be buried directly without fear of electrolytic action. A layer of sand surrounding the cable is usually adequate to protect the jacket from stones or other sharp objects. Above ground installations on messenger cables or other supports require the same hangers and intervals as in a vertical run. At the building entry, a small drip loop will prevent moisture from draining toward the building. Exposed horizontal runs should be protected from falling ice.

Bending the cable to the minimum bending radius (as shown in individual specifications) should be done with care.

Pressurization

Air-dielectric HELIAX coaxial cable should be maintained under dry-air or dry-nitrogen pressure at all times to prevent moisture condensation within the cable. All sizes are pressurizable to 10 lb/in^2 (70 kPa). An Andrew automatic dehydrator, manual dry-air pump or nitrogen bottle should be used to provide pressure to assure long-term, high-efficiency operation of your HELIAX coaxial cable installations. For pressurization equipment see pages 277-285.



RX5-1, 7/8", Andrew RADIAX Slotted Cable

RX4-1, 1/2", Andrew RADIAX Slotted Cable

RADIAX slotted coaxial cable* is designed to function as a continuous antenna. The slots in the corrugated copper cable allow a controlled portion of the transmitted RF signal to radiate along the entire length of the cable. Conversely, a signal transmitted near the cable will couple into these slots and be carried along the cable. Because of its broadband capability, a single RADIAX system can simultaneously handle two or more separate communications systems. Both horizontally and vertically polarized signals are radiated. Oil and moisture have no appreciable effect on attenuation. This results in a low-cost, maintenance-free installation.

The standard jacketing material is brown polyethylene. Fire-retardant jacketed cables are listed by Underwriters' Laboratories, Inc. and are gray in color to allow quick identification.

System Design Considerations

The primary objective in the design of a RADIAX system is to provide an adequate signal at all points in the system. For one-way applications, such as paging, calculations must be performed from the base station to the portable. In two-way applications, calculations must be performed from both base to portable unit and portable unit to base. Normally, portable to base is more critical due to the low transmit power level of the hand-held unit.

Routing. In general, RADIAX cable should be routed wherever coverage is required. In areas requiring substantial protection against vandalism, it can be enclosed in PVC tubing. For short distances, such as between floors or bulkheads, RADIAX cable can be routed through standard metal conduit.

Cable Selection. The optimum cable type is dependent on the operating frequency and the length of the run. Refer to the table on page 259.

Buildings. Types **RX4-2A**, **RX4-2R**, **RX4-3A** and **RX4-3R** are typically used in buildings. For best building coverage, the cable should be installed vertically in a non-metallic lined elevator or utility shaft. To provide uniform coverage, the shaft should be as close as possible to the center of the building. For buildings with large cross-sectional areas, more than one vertical run may be required. If the building is of heavily-reinforced steel construction, preliminary penetration tests should be made. In basement areas, a horizontal run of RADIAX cable may be required due to greater shielding.

Mines, Subways and Tunnels. Communication systems in mines, subways and tunnels are characterized by long distances over which coverage is required. The portable radio equipment is usually close to the RADIAX cable because of the limited cross section of most tunnels. For these systems Types **RX4-1**, **RX5-1**, **RX4-1R** and **RX5-1R** are recommended. These RADIAX cables have lower signal radiation and, therefore, low attenuation. The 7/8" RADIAX cables, Types **RX5-1** and **RX5-1R** are recommended for very long runs where the lowest attenuation is required.

Travelers Information Stations/Highway Advisory Radio (TIS/HAR). RADIAX slotted coaxial cable Type **RX4-3A** is ideal for highly-localized broadcasting. Its rugged construction withstands rough handling during installation. The copper outer conductor presents a formidable barrier against rodent attack for a long-life, maintenance-free system. A flooding compound between the jacket and outer conductor precludes water migration should the jacket become damaged. RADIAX cable is suitable for direct burial. In soil containing rock, the cable should be surrounded by a layer of sand. Installation can be by open trenching or by vibratory plowing.

Calculations. The system operating margin can be calculated using known values for transmit power, receiver sensitivity, cable and RADIAX attenuation loss, splitter insertion loss, and coupling loss. Coupling loss is the average difference between signal level in the cable and the signal received by a zero dBd gain antenna. It can vary significantly with small changes in distance. For system calculations, add 6 dB to the coupling loss each time distance from the cable is doubled in large open areas. In addition, a 15 dB "system use factor" is treated as a loss to allow for other variables.

The attenuation of Type **RX4-3A** for the TIS/HAR frequencies is 0.09 dB/100 ft (0.3 dB/100 m) at 530 kHz, and 0.17 dB/100 ft (0.56 dB/100 m) at 1610 kHz. Typically, transmitters of 20 to 30 watts RF power are sufficient for desired signal coverage when used with Type **RX4-3A**. For AM broadcast frequencies, the performance of RADIAX cable buried at typical depths of 15-24 in (400-600 mm) can be simulated by temporarily laying the cable on the ground. The zone of coverage, therefore, can be confirmed before committing to permanent burial.

For further information, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1058.

*Patented Australia 458,342; United States 3,691,488; Canada 929,243; United Kingdom 1,294,258.

Characteristics and Cable Selection

Type No. with standard jacketing	**RX4-1**	**RX4-2A**	**RX4-3A**	**RX5-1**
Type No. with fire retardant jacketing	**RX4-1R**	**RX4-2R**	**RX4-3R**	**RX5-1R**
Nominal Size	1/2″	1/2″	1/2″	7/8″
Cable Selection Guide				
150 MHz length, ft	over 2660	385-2660	to 385	very long*
(m)	(over 810)	(120-810)	(to 120)	
450 MHz length, ft	over 1110	120-1110	to 120	very long*
(m)	(over 335)	(35-335)	(to 35)	
900 MHz length, ft	over 350	25-350	to 25	very long*
(m)	(over 105)	(8-105)	(to 8)	
Electrical Characteristics				
Impedance, ohms	50	50	50	50
Velocity, percent	79	79	79	79
Typical VSWR, 30, 150, 450, 900 MHz	1.3	1.3	1.3	1.3
Attenuation, Nominal, in free space, dB/100 ft (dB/100 m)				
30 MHz	0.39 (1.28)	0.39 (1.28)	0.52 (1.71)	0.21 (0.69)
150 MHz	0.9 (2.95)	1.1 (3.61)	2.1 (6.89)	0.55 (1.80)
450 MHz	1.9 (6.23)	2.8 (9.19)	3.4 (11.2)	1.2 (3.94)
900 MHz	2.9 (9.51)	4.6 (15.1)	5.0 (16.4)	2.1 (6.89)
1700 MHz	4.5 (14.8)	7.5 (24.6)	8.0 (26.2)	3.5 (11.5)
Attenuation, Nominal, mounted to concrete, dB/100 ft (dB/100 m)				
30 MHz	0.39 (1.28)	0.59 (1.94)	0.74 (2.43)	0.21 (0.69)
150 MHz	0.9 (2.95)	1.1 (3.61)	2.1 (6.89)	0.55 (1.80)
450 MHz	1.9 (6.23)	2.9 (9.51)	11.3 (37.1)	1.2 (3.94)
900 MHz	3.3 (10.8)	5.6 (18.4)	**	2.1 (6.89)
1700 MHz	5.7 (18.7)	12.1 (39.7)	**	4.9 (16.1)
Coupling Loss at 20 ft (6.1 m), dB ±10 dB				
30 MHz	73	73	64	79
150 MHz	68	66	59	71
450 MHz	73	70	60	75
900 MHz	77	73	68	80
1700 MHz	80	76	73	81
Average Power Rating, kW				
30 MHz	4.3	4.3	4.3	9.0
150 MHz	1.7	1.7	1.7	3.7
450 MHz	0.9	0.9	0.9	1.9
900 MHz	0.6	0.6	0.6	1.3
1700 MHz	0.4	0.4	0.4	0.8
Mechanical Characteristics				
Diameter over jacket, in (mm)	0.62 (15.8)	0.62 (15.8)	0.62 (15.8)	1.1 (27.8)
Minimum Bending Radius, in (mm)	5 (125)	5 (125)	5 (125)	10 (250)
Cable Weight, lb/ft (kg/m)	0.16 (0.238)	0.16 (0.238)	0.16 (0.238)	0.44 (0.655)

*Very long runs such as subways, mines, etc.

**Not recommended.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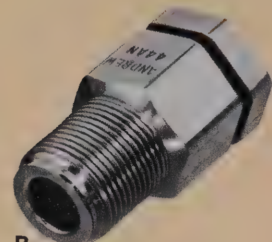
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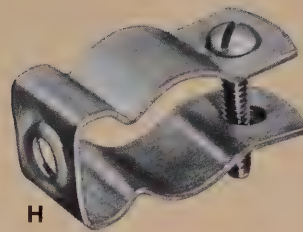
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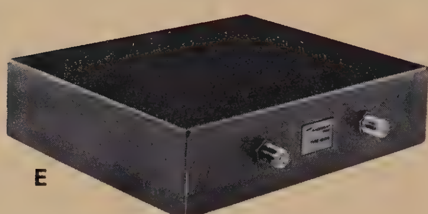
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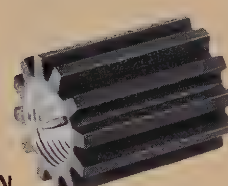
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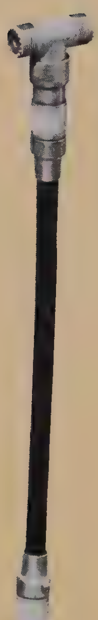
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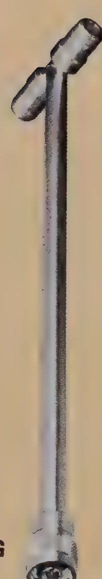
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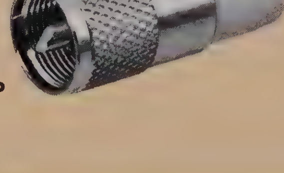
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Connectors

Type N connectors are recommended for 30, 150, 450 and 900 MHz. UHF connectors are suitable for 30 and 150 MHz.

	For Cable Size	Type No.
A	**N Plug (Male)** Mates with UG-23.	
	1/2"	**44AW**
	7/8"	**45AW**
B	**N Jack (Female)** Mates with UG-21.	
	1/2"	**44AN**
	7/8"	**45AN**
C	**UHF Plug (Male)** Mates with SO-239A.	
	1/2"	**44AP**
	7/8"	**45AP**
D	**UHF Jack (Female)** Mates with PL-259A.	
	1/2"	**44AU**
	7/8"	**45AU**

Mounting

RADIAX can be mounted directly against a nonconductive surface with metal hangers. For mounting on concrete or continuous metal surfaces, such as channels and messenger cables, insulated hangers with 0.5 in (13 mm) standoffs are required. Direct mounting on continuous metal surfaces is not recommended. Hangers with 2 in (50 mm) standoffs are recommended for mounting Types **RX4-3A** and **RX4-3R** on concrete. In all of the above cases, the free space attenuation figures listed on page 259 apply. When RADIAX is mounted on a conductive or lossy (such as concrete) surface, line attenuation may increase, compared with the free-space values. The attenuation values for direct mounting on concrete are listed on page 259.

Horizontal and vertical runs can be supported at 5 ft (1.5 m) intervals, but the spacing should be reduced to 3 ft (1 m) on top of metal members or on horizontal messenger cables.

Terminations

An antenna can be used to terminate the RADIAX and provide additional coverage at the end of the cable. Alternatively, terminating loads can be used to provide a suitable impedance match for the base station transmitter and/or receiver. For long runs, the RADIAX attenuation serves to reduce the open circuit VSWR. For example, 10 dB of line loss reduces the VSWR of an open circuit to 1.25. If this value is acceptable, a terminating load will not be required. For short runs, a 50 ohm load is usually needed.

H Metal Hanger Kit of 10.
1/4" mounting hardware not included.

For Cable Size	Plated Steel Type No.	Stainless Steel Type No.
1/2"	**40954**	**40954-2**
7/8"	**40785-1**	**40785-2**

J Insulated Messenger Cable Hanger Kit of 10.
With 0.5 in (13 mm) standoffs for 1/2" or 7/8" RADIAX . . . . Type **36720**

K Insulated Hanger Kit of 10.
With 0.5 in (13 mm) standoffs for 1/2" or 7/8" RADIAX. 1/4" mounting hardware not included . . . Type **36719**

L Standoff Hanger Kit of 10.
Provide 2 in (50 mm) standoffs for 1/2" or 7/8" RADIAX. 1/4" – 20 x 3 in machine screws included . . . . Type **43042**

M 150 or 450 MHz Whip Antenna
For coverage outside building or large inside area. UHF plug (male) input. 17.4 in (442 mm) . . . Type **42419**

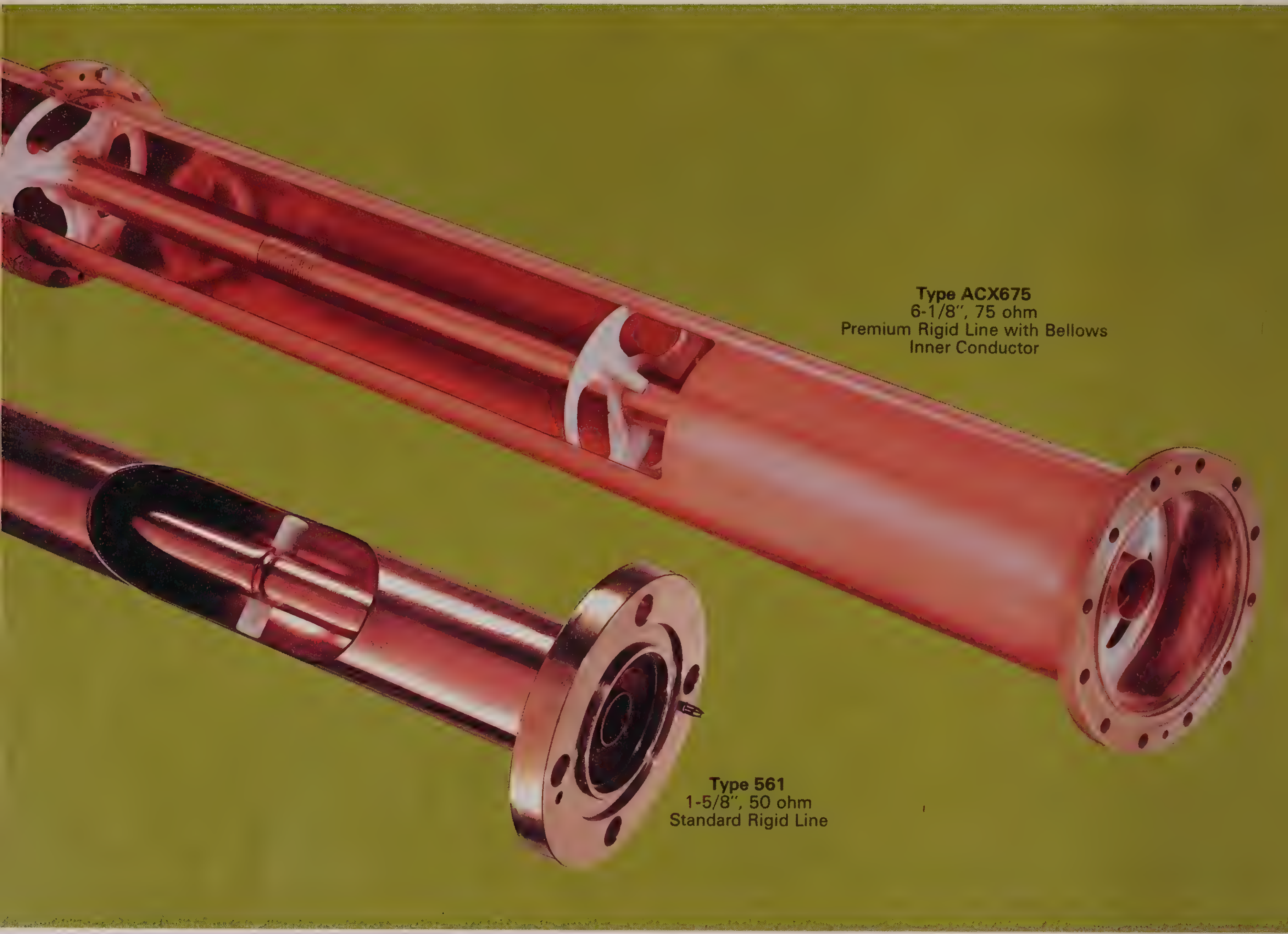
50-ohm Loads

Reference	Power Watts	Input	Type No.
N	25	N Plug	**32299-6**
O	10	N Jack	**32299-5**
P	2	UHF Plug	**42416**

Power Splitters

The units listed in the table include 50 ohm impedance transformers. 30 MHz splitters are mounted in 10 x 12 x 3 in (254 x 305 x 76 mm) aluminum cabinets.

Power Splitter	Reference Photo	Frequency	2-Way	3-Way	4-Way	Input Type	Output Type
Type No.	E	30 MHz	**42155**	**42156**	**42157**	UHF Jack	UHF Jack
	F	150 MHz	**42192**	**42193A**	**42194**	UHF Plug	UHF Jack
	G	450 MHz	**42152**	**42153**	**42154**	N Plug	N Jack
	G	900 MHz	**44612**	**44613**	**44614**	N Plug	N Jack
Splitter Loss		All	3 dB	5 dB	6 dB	—	—



Rigid Line

Andrew offers standard 1-5/8", 3-1/8" and premium ACX Series 3-1/8", 4-1/16" and 6-1/8" rigid transmission line and components for use in coaxial feeder installations. Transmission lines are manufactured from high conductivity, hard drawn copper tubing. Flanges and inner connectors are compatible with EIA Standard RS-225 and with IEC recommendations. Electrical and mechanical characteristics are listed on page 263

Standard Transmission Line has PTFE dielectric peg insulators and silver soldered flanges.

Premium Transmission Line features heavy-duty Teflon* disk insulators and heavy duty welded flanges.

Premium Bellows Transmission Line includes a patented† bellows inner conductor design which compensates for differential expansion between the inner and outer conductors. Mechanical wear from sliding contacts is eliminated. The result is extremely long life.

All flanged sections come complete with one inner connector, a set of stainless steel flange hardware and a pressure sealing gasket.

*Trademark of DuPont
†Patented United States 4,543,548

Electrical Characteristics

Important electrical parameters to consider for selection of broadcast transmission lines are attenuation, power handling and VSWR.

Attenuation of a transmission line varies with frequency, temperature and load VSWR. A graph of attenuation versus frequency is given on page 264. These curves are based on an ambient temperature of 75°F (24°C) and unity VSWR. The values obtained from this graph can be corrected for other temperatures and load VSWRs using the curves in Figures 1 and 2 on page 219.

Power Handling. Peak power ratings do not vary with frequency, but can be significantly increased by pressurization. Average power ratings are dependent on frequency, pressurization and VSWR. Average power rating curves for standard conditions are given on page 264.

VSWR. The rigid line features excellent VSWR, typically 1.02 maximum per component and 1.07 maximum per system. Optimized systems having 1.05 or better VSWR across the operating channel are also available. Contact your local Andrew Sales Office listed inside the back cover for information on guaranteed VSWR ratings.

Rigid Line Section Lengths for Recommended Specific Channels

20 Foot (6.096 m) Sections	19.75 Foot (6.020 m) Sections	19.5 Foot (5.944 m) Sections
2, 3, 5, 6, All FM, 7, 8, 11, 12, 14, 15, 18, 19, 23, 27, 31, 35, 39, 40, 43, 44, 47, 48, 52, 56, 60, 64, 68	16, 20, 24, 28, 32, 33, 36, 37, 41, 45, 49, 53, 57, 58, 61, 62, 65, 66, 69	4, 9, 10, 13, 17, 21, 22, 25, 26, 29, 30, 34, 38, 42, 46, 50, 51, 54, 55, 59, 63, 67

Rigid Line Components

	1-5/8" 50-ohm	3-1/8" 50-ohm	4-1/16" 50-ohm	6-1/8" 50-ohm	6-1/8" 75-ohm
Standard Straight Section					
20 ft flanged both ends	561	562A	—	—	—
20 ft flanged one end	561-11	562A-11	—	—	—
20 ft unflanged	561-21	562A-21	—	—	—
** flanged both ends	2761-1	2762A-1	—	—	—
** flanged one end	2761-11	2762A-11	—	—	—
** unflanged	2761-21	2762A-21	—	—	—
Premium Straight Section					
20 ft flanged both ends	—	ACX350-31-(*)	ACX450-31-(*)	ACX650-31-(*)	ACX675-31-(*)
20 ft flanged one end	—	ACX350-34-(*)	ACX450-34-(*)	ACX650-34-(*)	ACX675-34-(*)
20 ft unflanged	—	ACX350-35-(*)	ACX450-35-(*)	ACX650-35-(*)	ACX675-35-(*)
19.75 ft flanged both ends	—	ACX350-32-(*)	ACX450-32-(*)	ACX650-32-(*)	ACX675-32-(*)
19.5 ft flanged both ends	—	ACX350-33-(*)	ACX450-33-(*)	ACX650-33-(*)	ACX675-33-(*)
Premium Straight Sections with Bellows					
20 ft flanged both ends	—	ACX350-1-(*)	ACX450-1-(*)	ACX650-1-(*)	ACX675-1-(*)
20 ft flanged one end	—	ACX350-4-(*)	ACX450-4-(*)	ACX650-4-(*)	ACX675-4-(*)
20 ft unflanged	—	ACX350-5-(*)	ACX450-5-(*)	ACX650-5-(*)	ACX675-5-(*)
19.75 ft flanged both ends	—	ACX350-2-(*)	ACX450-2-(*)	ACX650-2-(*)	ACX675-2-(*)
19.5 ft flanged both ends	—	ACX350-3-(*)	ACX450-3-(*)	ACX650-3-(*)	ACX675-3-(*)

*Specify Television Channel No. or Frequency. **Specify length, indicating inches or millimetres. Standard tolerance is ± 1/8 in (3 mm)

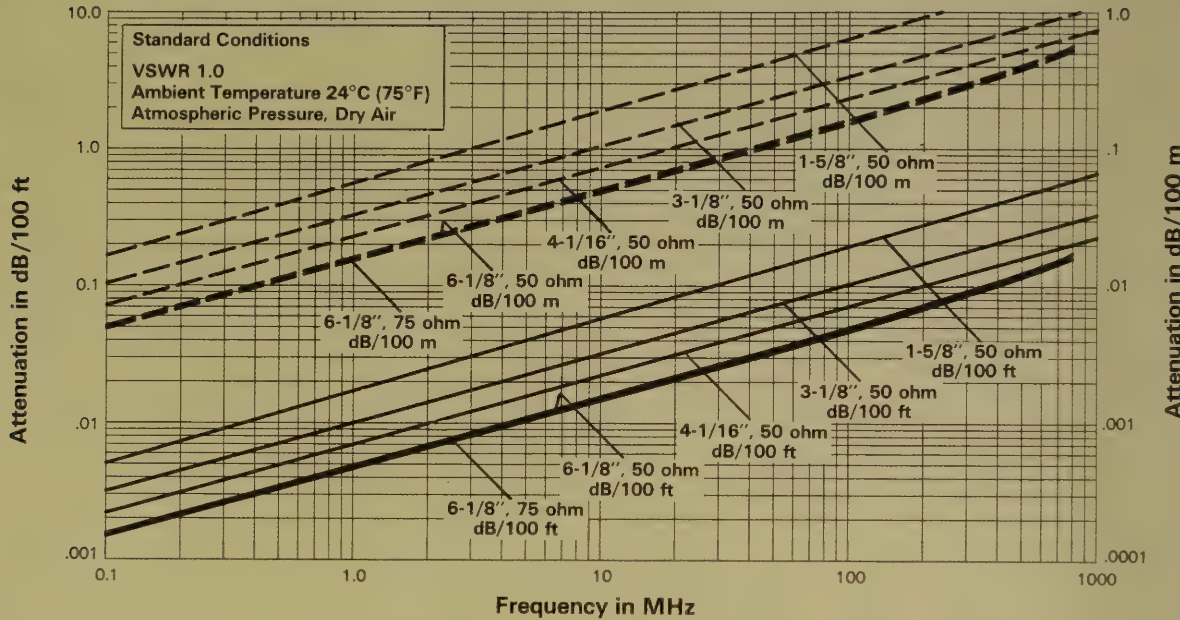
Characteristics

	1-5/8" 50-ohm	3-1/8" 50-ohm	3-1/8" 50-ohm	4-1/16" 50-ohm	6-1/8" 50-ohm	6-1/8" 75-ohm
Type No.	561	562A	ACX350	ACX450	ACX650	ACX675
Impedance, ohms	50	50	50	50	50	75
Max. Frequency, MHz	3000	500	1588	1197	788	900
Velocity, percent	99.8	99.8	99.7	99.7	99.7	99.8
Attenuation, see graph on page 264						
Average Power Rating, see graph on page 264						
Peak Power Rating, kW	145	500	500	750	1500	1000
Dimensions						
Outer Conductor, outside dia. in (mm)	1.625 (41)	3.125 (79)	3.125 (79)	4.062 (103)	6.125 (156)	6.125 (156)
inside dia. in (mm)	1.527 (38)	3.027 (77)	3.027 (77)	3.935 (110)	5.981 (152)	5.981 (152)
Inner Conductor, outside dia. in (mm)	0.664 (17)	1.315 (33)	1.315 (33)	1.711 (43)	2.600 (66)	1.711 (43)
inside dia. in (mm)	0.588 (15)	1.231 (31)	1.231 (31)	1.631 (41)	2.520 (64)	1.631 (41)
Inner Cutback, in (mm)	0.625 (15.9)	0.845 (21)	0.845 (21)	1.200 (30)	1.280 (32)	1.200 (30)
Net Weight, lb/ft (kg/m)	1.35 (2.0)	3.0 (4.5)	3.0 (4.5)	5.6 (8.3)	7.3 (10.9)	6.75 (10)

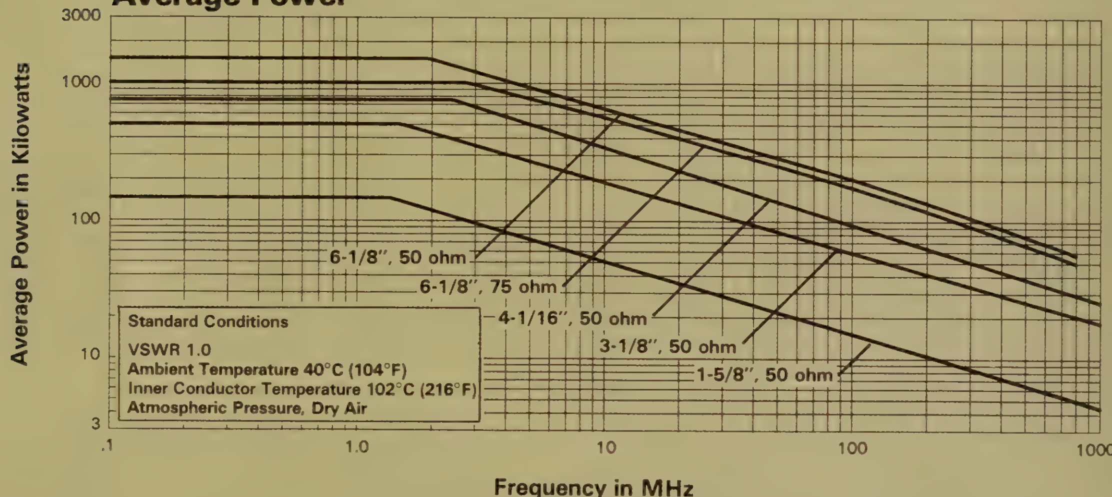
Standard Flange Dimensions

Line Size	7/8"	1-5/8"	3-1/8"	4-1/16"	6-1/8"
Flange, Overall Diameter, in (mm)	2.25 (57.1)	3.50 (88.9)	5.19 (131.8)	6.19 (157.2)	8.13 (206.5)
Bolt Circle Diameter, in (mm)	1.750 (44.45)	2.810 (71.37)	4.375 (111.1)	5.375 (136.5)	7.375 (187.3)
Number of Bolts	3	4	6	8	12
Bolt Size, in	1/4	5/16	3/8	3/8	3/8

Attenuation



Average Power



Attenuation and Average Power Ratings

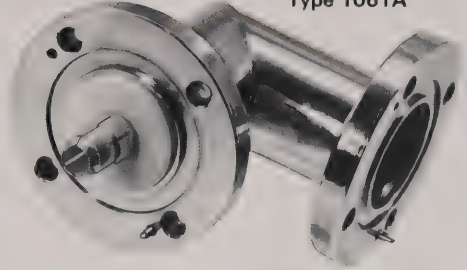
Television Channel No. (MHz)	1-5/8", 50 ohm Attenuation dB/100 ft (100 m)	1-5/8", 50 ohm Average Power kW	3-1/8", 50 ohm Attenuation dB/100 ft (100 m)	3-1/8", 50 ohm Average Power kW	4-1/16", 50 ohm Attenuation dB/100 ft (100 m)	4-1/16", 50 ohm Average Power kW	6-1/8", 50 ohm Attenuation dB/100 ft (100 m)	6-1/8", 50 ohm Average Power kW	6-1/8", 75 ohm Attenuation dB/100 ft (100 m)	6-1/8", 75 ohm Average Power kW
2 (55.25)	0.142 (0.467)	20.0	0.077 (0.254)	77.5	0.054 (0.176)	127	0.037 (0.122)	267	0.0332 (0.109)	239
6 (83.25)	0.177 (0.580)	16.4	0.095 (0.311)	63.2	0.066 (0.215)	101	0.046 (0.150)	217	0.0416 (0.137)	191
* (100.00)	0.195 (0.640)	15.0	0.103 (0.338)	58.2	0.071 (0.234)	92.6	0.050 (0.163)	200	0.0460 (0.152)	173
7 (175.25)	0.261 (0.856)	11.1	0.138 (0.452)	43.5	0.095 (0.312)	67.2	0.068 (0.223)	144	0.0635 (0.209)	125
13 (211.25)	0.288 (0.946)	10.1	0.151 (0.496)	39.6	0.104 (0.342)	60.6	0.076 (0.248)	129	0.0708 (0.232)	112
14 (471.25)	0.442 (1.45)	6.63	0.227 (0.744)	26.4	0.156 (0.512)	38.7	0.121 (0.396)	79.2	0.1145 (0.376)	69.5
25 (537.25)	0.475 (1.56)	6.18	0.242 (0.795)	24.7	0.167 (0.546)	36.0	0.131 (0.430)	73.0	0.1242 (0.408)	64.0
35 (597.25)	0.503 (1.65)	5.84	0.256 (0.839)	23.4	0.176 (0.576)	33.9	0.140 (0.460)	68.4	0.1327 (0.436)	59.9
45 (657.25)	0.530 (1.74)	5.55	0.268 (0.881)	22.3	0.184 (0.605)	32.2	0.149 (0.489)	64.4	0.1409 (0.463)	56.4
55 (717.25)	0.556 (1.82)	5.30	0.281 (0.920)	21.3	0.193 (0.632)	30.6	0.159 (0.522)	60.4	0.1489 (0.489)	53.4
65 (777.25)	0.581 (1.91)	5.07	0.292 (0.959)	20.4	0.201 (0.658)	29.3	0.173 (0.566)	55.9	0.1568 (0.506)	50.7
69 (801.25)	0.592 (1.94)	4.98	0.297 (0.973)	20.1	0.204 (0.668)	28.8	0.178 (0.584)	54.3	0.1599 (0.526)	49.7

Attenuation and Average Power data guaranteed within ±5%.

*FM Radio Band.

All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Type 1061A

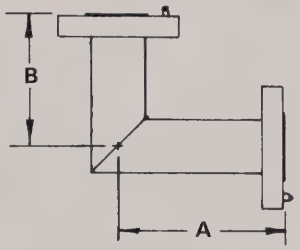


90° Miter Elbow

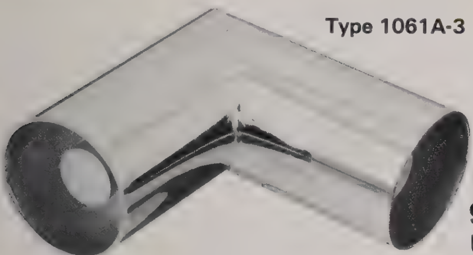
Swivel flanges, brass construction.

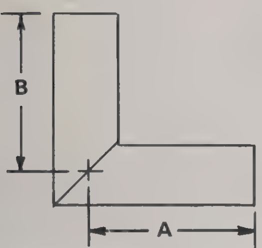
Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**1060A**	50	3.08 (78)	2.44 (62)	1.4 (0.64)
1-5/8"	**1061A**	50	2.89 (73)	2.89 (73)	3.5 (1.59)
3-1/8"	**1062A**	50	4.19 (106)	4.19 (106)	10.7 (4.86)
4-1/16"	**ACX450-10-(*)**	50	6.00 (152)	12.00 (305)	18.7 (8.49)
6-1/8"	**ACX650-10-(*)**	50	7.00 (178)	14.00 (356)	31.0 (14.1)
6-1/8"	**ACX675-10-(*)**	75	7.00 (178)	14.00 (356)	29.0 (13.2)

*Specify Television Channel or Frequency.



Type 1061A-3



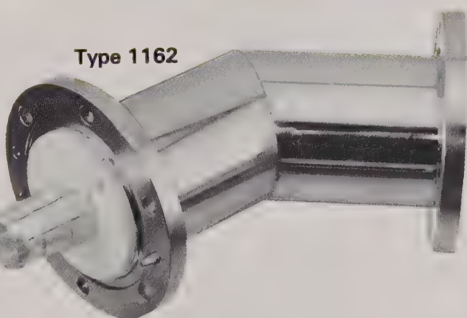


90° Miter Elbow

Unflanged. Does not include inner connector.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8"	**1061A-3**	2.73 (69)	2.73 (69)	0.69 (0.32)
3-1/8"	**1062A-3**	4.00 (102)	4.00 (102)	2.63 (1.20)

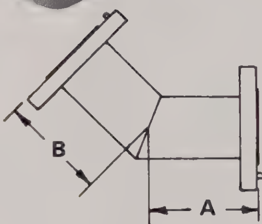
Type 1162



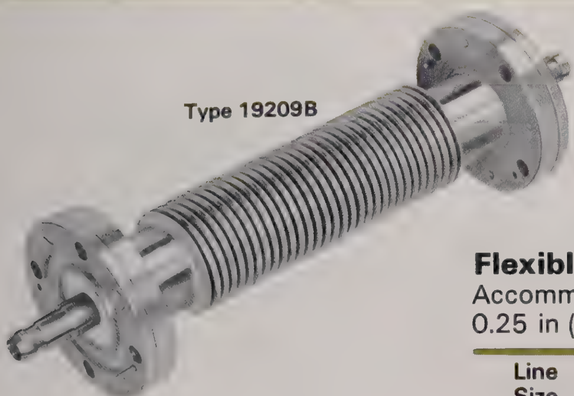
45° Miter Elbow

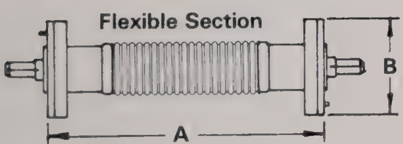
Swivel flanges, brass construction.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**1162**	50	4.50 (114)	4.50 (114)	9.0 (4.09)



Type 19209B





Flexible Section

Accommodates vibration and angles up to 30°. Maximum offset 0.25 in (6 mm) for 1-5/8" line and 0.5 in (13 mm) for 3-1/8" line.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8"	**20695**	50	10.0 (254)	3.5 (89)	4.2 (1.91)
3-1/8"	**19209B**	50	18.0 (457)	5.19 (132)	15.0 (6.81)

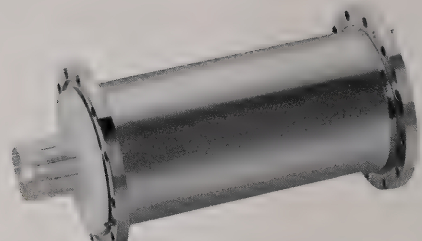
All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

6-1/8" Impedance Transformer

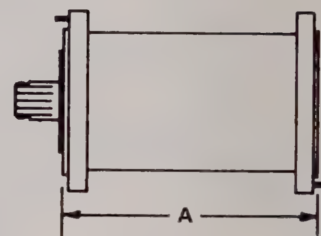
Connects 6-1/8", 75-ohm line to 6-1/8", 50-ohm line. Includes inner connector for 50-ohm. No gas barrier.

Type	Channel No.	A, in (mm)	Weight, lb (kg)
ACX675-17-2	2	56.28 (1430)	45.0 (20.0)
ACX675-17-3	3	51.35 (1304)	42.0 (19.1)
ACX675-17-4	4	47.28 (1201)	40.0 (18.2)
ACX675-17-5	5	43.86 (1114)	38.0 (17.3)
ACX675-17-6	6	40.95 (1040)	36.0 (16.4)
ACX675-17-(*)	7 thru 13	21.19 (538)	25.0 (11.4)
ACX675-17-(*)	14 thru 26	13.22 (336)	22.0 (10.0)
ACX675-17-(*)	27 thru 39	11.65 (296)	20.0 (9.1)
ACX675-17-(*)	40 thru 53	10.46 (266)	19.0 (8.7)
ACX675-17-(*)	54 thru 69	9.52 (242)	18.0 (8.2)

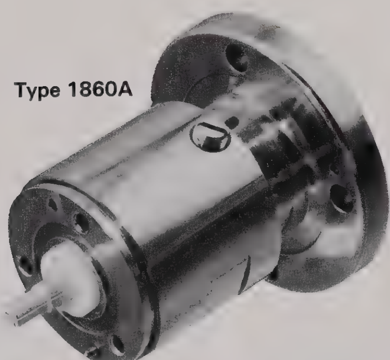
*Specify Channel No.

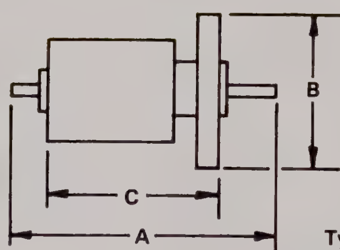


Type ACX675-17



Type 1860A





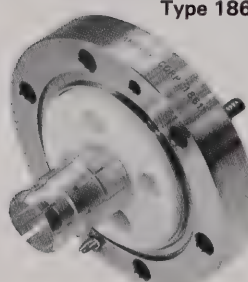
Types 1860A and 1872

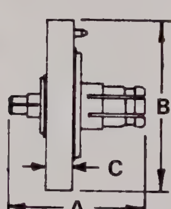
Reducer 50-ohm

Includes two inner connectors. No gas barrier.

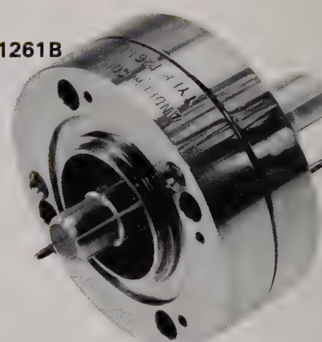
Line Size	Type	A in (mm)	B in (mm)	C in (mm)	Weight lb (kg)
1-5/8" to 7/8"	**1860A**	5.46 (139)	3.50 (89)	3.34 (85)	2.3 (1.1)
3-1/8" to 1-5/8"	**1861**	4.13 (105)	5.19 (132)	0.85 (22)	5.6 (2.6)
6-1/8" to 3-1/8"	**1872**	11.69 (297)	8.13 (207)	7.13 (181)	20.0 (9.1)

Type 1861





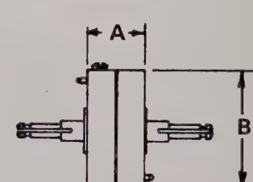
Type 1261B



Gas Barrier

Fixed male inner connectors both ends. One side has a pressure port.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**1260A**	50	1.13 (29)	2.25 (57)	1.2 (0.55)
1-5/8"	**1261B**	50	1.66 (42)	3.50 (89)	3.6 (1.7)
3-1/8"	**1262B**	50	1.00 (25)	5.19 (132)	4.75 (2.2)
4-1/16"	**ACX450-16**	50	2.00 (51)	6.19 (157)	15.0 (6.8)
6-1/8"	**ACX650-16**	50	2.00 (51)	8.13 (206)	20.0 (9.1)
6-1/8"	**ACX675-16**	75	2.00 (51)	8.13 (206)	19.4 (8.8)



All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Type 2260B

Type N Female Adaptor

Mates with UG21. Gas tight with pressure port.
Includes inner connector and hardware.

Line Size	Type	Weight lb (kg)
7/8″	**2260B**	1.2 (0.55)
1-5/8″	**2261A**	3.4 (1.55)
3-1/8″	**2262**	5.6 (2.55)

Type LC Female Adaptor

Mates with UG154. Gas tight with pressure port.
Includes inner connector and hardware.

Line Size	Type	Weight lb (kg)
7/8″	**2360A**	1.2 (0.55)
1-5/8″	**2361A**	3.4 (1.55)

Type 2361A

Type 30452

Male-to-Male Adaptor

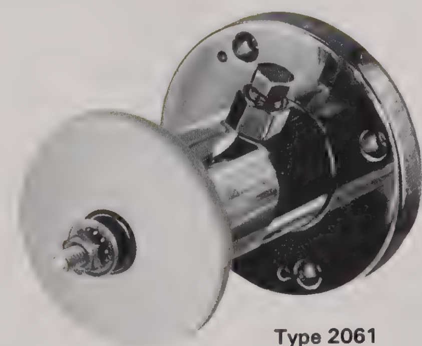
Joins two components having captivated inner connectors.
6 in (150 mm) length. No inner connectors. Includes hardware.

Line Size	Type	Weight lb (kg)
1-5/8″	**30452**	3 (1.36)
3-1/8″	**23187**	6 (2.72)

End Terminal

For strap connection. Gas tight with pressure port.

Line Size	Type	Weight lb (kg)
1-5/8″	**2061**	2.3 (1.04)
3-1/8″	**2062**	6.3 (2.86)

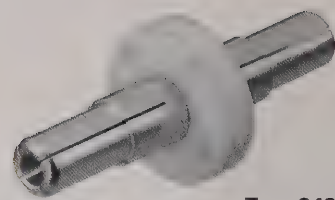


Type 2061

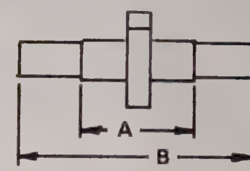
Inner Connector

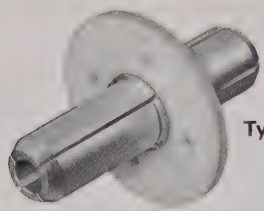
Includes PTFE anchor disk.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**34389A**	50	0.93 (24)	1.94 (49)	0.06 (0.03)
1-5/8"	**34660**	50	1.17 (30)	2.30 (58)	0.13 (0.06)
3-1/8"	**15093A**	50	1.69 (43)	4.13 (105)	0.63 (0.29)
3-1/8"	**ACX350-20**	50	1.69 (43)	4.13 (105)	0.63 (0.29)
4-1/16"	**ACX450-20**	50	2.40 (61)	5.40 (137)	2.10 (0.96)
6-1/8"	**ACX650-20**	50	2.40 (61)	5.40 (137)	2.90 (1.32)
6-1/8"	**ACX675-20**	75	2.40 (61)	5.40 (137)	2.10 (0.96)

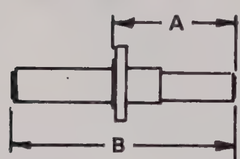


Type 34389A





Type 4851



Adaptor Inner Connector

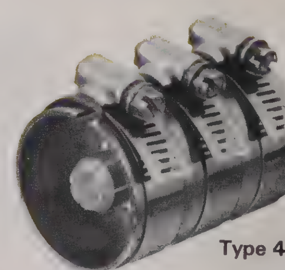
50-51.5 ohm.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**4850A**	1.31 (33)	2.31 (59)	0.03 (0.014)
1-5/8"	**4851**	1.18 (30)	2.34 (59)	0.16 (0.073)
3-1/8"	**4852**	2.16 (55)	3.62 (92)	0.31 (0.141)

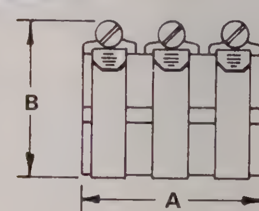
Unpressurized Coupling

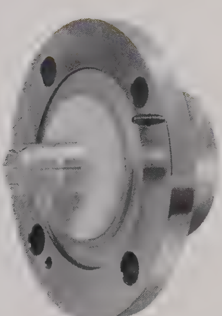
Connects unflanged lines and fittings. Includes supported inner connector and sleeve outer connector with clamps.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8"	**4861A**	2.50 (64)	2.25 (57)	0.5 (0.23)
3-1/8"	**4862A**	3.50 (89)	3.70 (94)	1.5 (0.68)



Type 4862A





Soft Solder Swivel Field Flange Kit

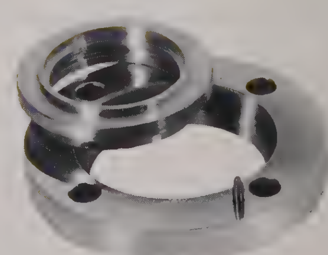
For use on interior runs. Includes hardware, soft solder, "O" ring, silicone lubricant and inner connector.

Line Size	Type	Weight, lb (kg)
7/8"	**1560A**	0.7 (0.32)
1-5/8"	**1561A**	1.3 (0.59)
3-1/8"	**ACX350-37**	2.9 (1.32)
4-1/16"	**ACX450-37**	3.6 (1.64)
6-1/8"	**ACX675-37**	4.4 (2.00)

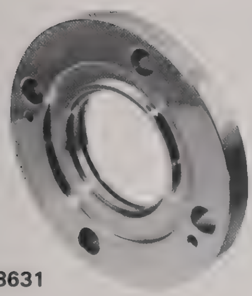
Swivel Flange Kit

Includes fixed ring, sliding ring, silver solder and flux. Order hardware kit separately.

Line Size	Type	Weight, lb (kg)
7/8"	**18096**	0.44 (0.20)
1-5/8"	**18041**	0.94 (0.43)
3-1/8"	**18200**	2.00 (0.91)
4-1/16"	**ACX450-27**	2.60 (1.18)
6-1/8"	**ACX675-27**	3.34 (1.52)



Type 18041



Type 18631

Fixed Flange Kit

Includes silver solder and flux. Order hardware kit separately.

Line Size	Type	Weight, lb (kg)
7/8″	**18630**	0.38 (0.18)
1-5/8″	**18631**	0.94 (0.43)
3-1/8″	**15840**	2.00 (0.91)
4-1/16″	**ACX450-28**	2.60 (1.18)
6-1/8″	**ACX675-28**	3.75 (1.70)

Hardware Kit

Includes "O" ring, silicone lubricant, nuts, bolts and lockwashers for one flange joint.

Line Size	Type	Weight, lb (kg)
7/8″	**66748-6**	0.03 (0.02)
1-5/8″	**69225-2**	0.25 (0.12)
3-1/8″	**69226-2**	0.50 (0.23)
4-1/16″	**ACX450-21**	0.80 (0.37)
6-1/8″	**ACX675-21**	1.13 (0.52)

"O" Ring Gasket

For EIA flange.

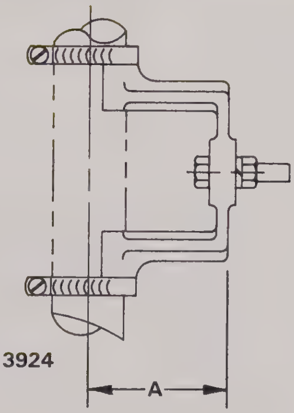
Line Size	Type	Line Size	Type
7/8″	**10683-197**	4-1/16″	**10683-551**
1-5/8″	**10683-406**	6-1/8″	**10683-10**
3-1/8″	**10683-405**		

Hangers for Standard Rigid Line

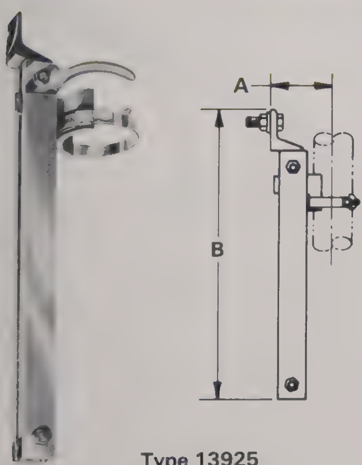
Rigid Hanger

Use one on top section for every 300 ft (90 m) of line. Mounts to 9/16 in (14 mm) diameter hole with included 1/2″ diameter bolt or to angle adaptors.

Line Size	Type	A in (mm)	Weight, lb (kg)
1-5/8″	**13924**	3.06 (77.7)	1.4 (0.64)
3-1/8″	**13927**	3.81 (96.8)	2.0 (0.91)



Type 13924



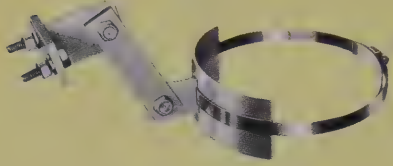
Type 13925

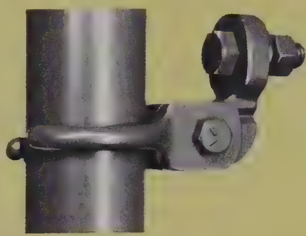
Spring Hanger

Accommodates line expansion and contraction. Use at 50 ft (15 m) intervals for 1-5/8″ and 10 ft (3 m) intervals for 3-1/8″. Mounts to 9/16 in (14 mm) diameter hole with included 1/2″ diameter bolt or to angle adaptors.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8″	**14379**	3.06 (77.7)	14.0 (355.6)	3.8 (1.73)
3-1/8″	**13925**	3.81 (96.8)	13.2 (335.3)	5.4 (2.45)

Hangers for Standard Rigid Line (continued)


A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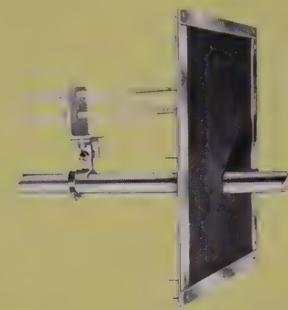
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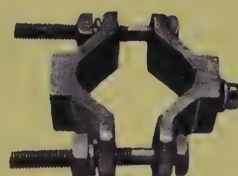
D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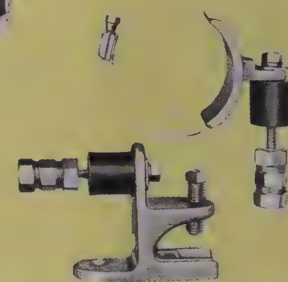

F

A Horizontal Hanger
Permits axial movement caused by expansion and contraction. Includes clamps and hardware. Use at 10 ft (3 m) intervals.
1-5/8" line .... Type **3911**
3-1/8" line .... Type **3912**

B Sliding Hanger
Use at 10 ft (3 m) intervals. Mounts to 9/16" (14 mm) diameter hole with 1/2" diameter bolt, or to angle adaptor.
1-5/8" line .... Type **14378**

C Horizontal Anchor
Anchors line to entry wall at angles up to 45°. Includes weather-proof cover and support bracket.
1-5/8" .... Type **3901**
3-1/8" .... Type **3902**

D Angle Adaptor
For attaching hangers to tower angle members, up to 7/8" (22 mm) thick .... Type **13555A**

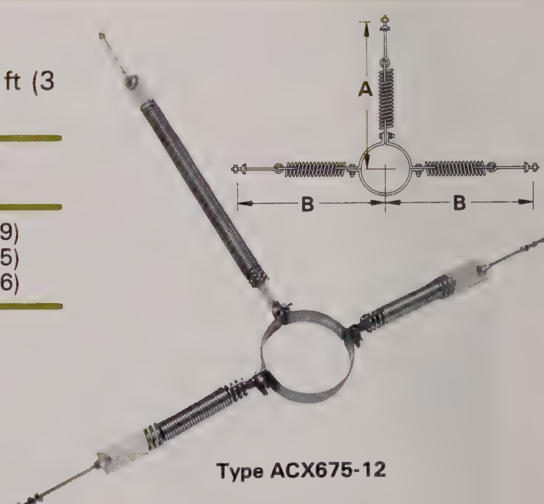
E Round Member Adaptor
For attaching hanger to tower members, up to 3 in (75 mm) diameter .... Type **13550**

F Lateral Brace
For bottom of vertical run. Prevents lateral motion, Includes rubber cushion and end fittings for 1/2" conduit.
1-5/8" .... Type **3921**
3-1/8" .... Type **3922**

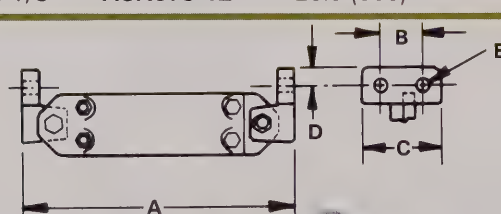
Hangers for Premium Rigid Line

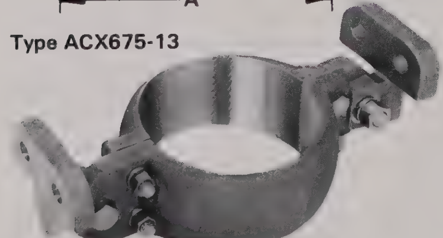
3-Point Suspension Hanger
Accommodates vertical movement in the horizontal run caused by differential expansion and contraction of the vertical run. Use at 10 ft (3 m) intervals.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	ACX350-12	26.0 (660)	15.0 (381)	5.25 (2.39)
4-1/16"	ACX450-12	26.0 (660)	17.75 (266)	6.50 (2.95)
6-1/8"	ACX675-12	26.0 (660)	17.75 (266)	9.38 (4.26)



Type ACX675-12




Type ACX675-13

Rigid Hanger
Use one on top section for every 1000 ft (300 m) of line.

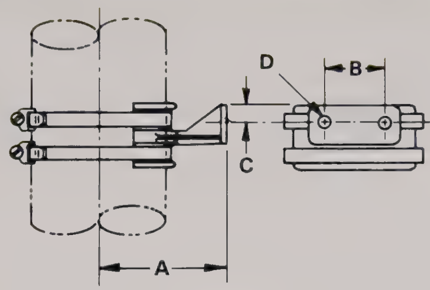
Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	Weight lb (kg)
6-1/8"	ACX675-13	14.50 (368.3)	2.25 (57.2)	4.25 (108)	1.0 (25.4)	0.688 (17.5)	21.6 (9.82)

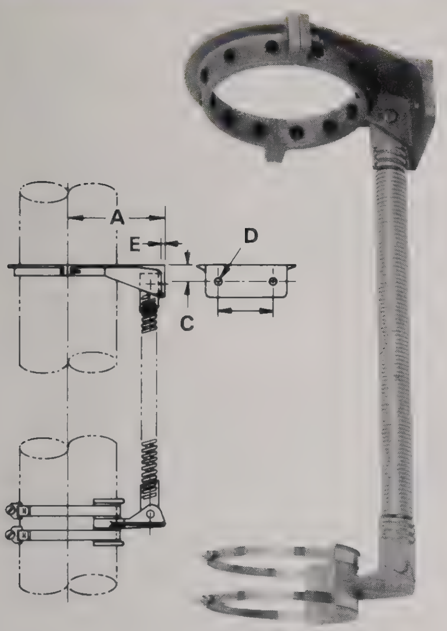
Hangers for Premium Rigid Line (continued)

Rigid Hanger

Use one on top section for every 500 ft (150 m) of 4-1/6" line; 300 ft (90 m) of 3-1/8" line.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	Weight lb (kg)
3-1/8"	13927	See description on page 269				
4-1/16"	ACX450-13	5.25 (133.4)	2.125 (54)	1.00 (25.4)	0.656 (16.7)	15.0 (6.82)

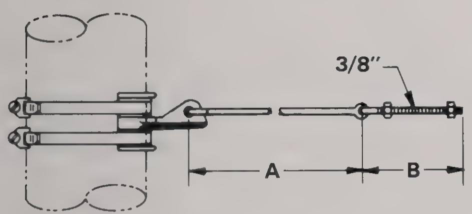




Vertical Spring Hanger

Use at 10 ft (3 m) intervals. Supports the transmission line. Prevents lateral motion, and accommodates differential expansion and contraction.

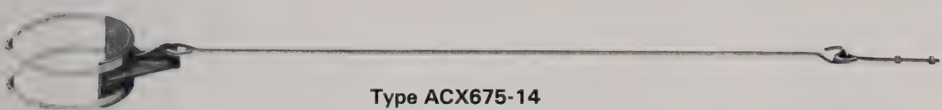
Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	Weight lb (kg)
3-1/8"	ACX350-11	4.25 (108)	1.75 (44.5)	1.00 (25.4)	.560 (14.2)	.38 (9.7)	6.0 (2.73)
4-1/16"	ACX450-11	5.75 (146)	2.38 (60.5)	1.50 (38.1)	.656 (16.7)	.50 (12.7)	11.0 (5.0)
6-1/8"	ACX675-11	6.35 (161.3)	2.38 (60.5)	1.50 (38.1)	.656 (16.7)	.50 (12.7)	16.5 (7.50)

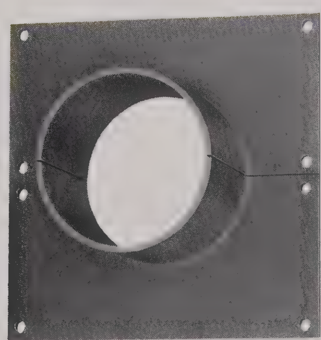


Lateral Brace

Mounts through single 13/32 in (11 mm) hole. Used to restrict lateral motion of line while permitting vertical and horizontal movement.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	ACX350-14	40.0 (1016)	6.50 (165.1)	2.25 (1.02)
4-1/16"	ACX450-14	40.0 (1016)	6.50 (165.1)	2.75 (1.25)
6-1/8"	ACX675-14	40.0 (1016)	6.50 (165.1)	4.13 (1.88)

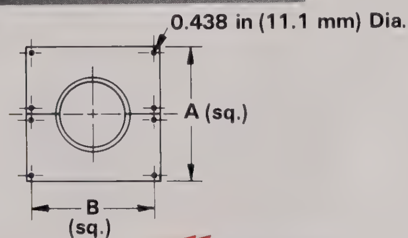

Type ACX675-14


Type ACX675-15

Wall Feed Thru

Includes split mounting plate, two split rubber seals and sealing compound. Uses 3/8" mounting hardware (not included).

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	ACX350-15	8.0 (203.2)	6.87 (174.5)	8.2 (3.73)
4-1/16"	ACX450-15	9.0 (228.6)	7.75 (196.9)	9.4 (4.27)
6-1/8"	ACX675-15	14.0 (355.6)	12.8 (325.1)	17.5 (7.95)



Circular Waveguide for UHF-TV

Circular waveguide offers lowest attenuation, high power handling capability and extremely low signal distortion for UHF-TV transmitting antenna systems.

The circular shape presents a uniform profile. Windload is only 60% compared with the windload for equivalent size rectangular waveguide.

Andrew offers four sizes of circular waveguide, each optimized for a specific range of UHF-TV channels.

Features

Welded aluminum construction offers maximum strength and reliability.

High power filters provide stability and eliminate ghosting, unwanted reflections and picture smear. An exclusive 90° bend permits the use of circular waveguide for both the vertical and horizontal runs, resulting in a continuous run of circular waveguide from the transmitter to the antenna. Constant force spring hangers simplify tower planning and installation.

An integrated pressurization system prevents moisture condensation in the transmitting antenna as well as in the waveguide.

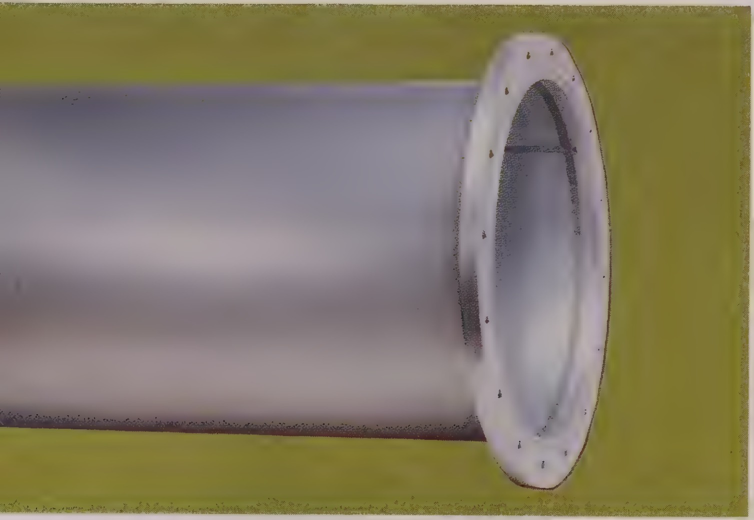
Typical System

See page 35 for a typical UHF-TV transmitting system using circular waveguide.

Components

The following components comprise a circular waveguide system.

Straight Sections. 12 foot length, all aluminum construction including flanges.



90° Bend. Used at bottom of vertical run to provide continuous circular waveguide run from transmitter to antenna.

Input Option. Converts coax or rectangular waveguide to circular waveguide at the transmitter end of the run.

Output Option. Converts circular waveguide to rectangular waveguide or coax at antenna end of the run.

Circular Pin Twist. Determines plane of polarization at input or output.

Gas Barrier. Installed adjacent to the input assembly.

Axial Ratio Compensator. A rotatable clamp assembly installed adjacent to the gas barrier. Provides adjustment for maximum polarization isolation.

Top Rigid Support Hanger. Anchors and secures waveguide at top of vertical run. Allows fine adjustment of lateral and vertical positioning of waveguide run.

Vertical (Constant Force) Spring Hanger. Supports vertical waveguide run, prevents lateral motion and accommodates differential expansion and contraction from 1 in to 36 in (25–915 mm) total movement.

Lateral Supports. Used at bottom of vertical run to prevent lateral motion.

Horizontal Spring Hanger. Supports horizontal waveguide run and accommodates vertical movement caused by differential expansion and contraction of the vertical run.

Hardware. All waveguide components are supplied with flange nuts, bolts, washers and gaskets. Waveguide hangers are provided with 5/8" hardware for tower mounting.

Straight Sections Weights and Dimensions

Channel Numbers	Size	Frequency Band MHz	Diameter in (mm)	Length ft (m)	Weight lb (kg)
14 – 19	WC1750	470 – 506	17.5 (445)	12 (3.66)	112 (50)
20 – 23	WC1700	506 – 530	17.0 (432)	12 (3.66)	110 (49)
24 – 41	WC1750	530 – 638	17.5 (445)	12 (3.66)	112 (50)
39 – 59	WC1500	620 – 746	15.0 (381)	12 (3.66)	95 (43)
56 – 69	WC1350	722 – 806	13.5 (343)	12 (3.66)	85 (39)

Spare Hardware Kit. Bolts, nuts, lock washers and gasket for one flange joint.

Pressurization System

Circular waveguide should be maintained under dry gas pressure up to 1.5 lb/in² (10.5 kPa) to prevent moisture condensation.

Pressurization Kit Type 163452 includes two Type 1920E dehydrators (see page 277), pressurization monitor, low pressure regulator and relief valve assembly. Maintains system pressure within the 1 to 2 lb/in² (7 to 14 kPa) range.

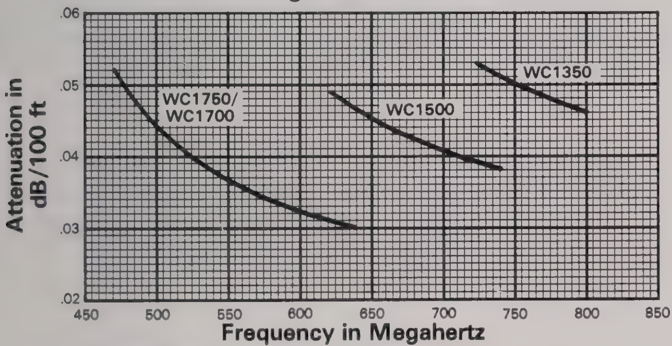
System Performance and Stability

VSWR: 1.08 or better over channel with optimization at visual carrier to 1.05 or better.

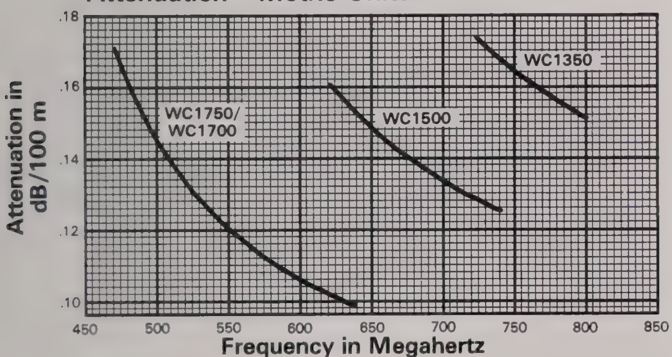
Reconverted Mode Level: minus 50 dB or better for all trapped modes at system output.

Cross Polarization Loss: total power lost in reject loads from all sources will not exceed 1% of transmitter power during normal operating conditions, nor exceed 2% during brief periods of extreme environmental conditions.

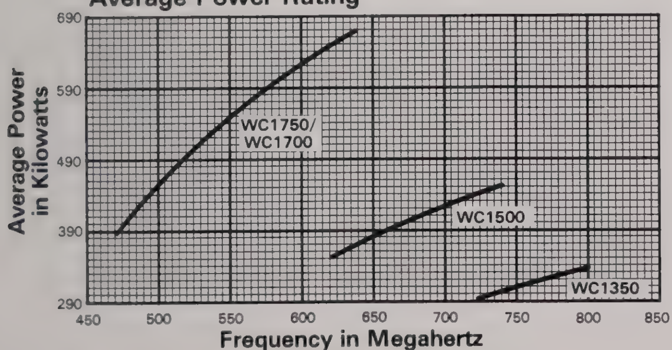
Attenuation – English Units



Attenuation – Metric Units



Average Power Rating



Flange Reflection: circular waveguide does not exhibit band reject VSWR spikes associated with coaxial and rectangular waveguide transmission lines because of the negligible mismatch at the circular flange junctions.

Ordering Information

Andrew offers circular waveguide for UHF-TV on a system basis. Individual components are available only as replacement for existing Andrew installations.

To order a circular waveguide system, specify the following:

- Operating Channel.
- Waveguide Size (WC1750, WC1700, WC1500 or WC1350)
- Length of vertical run in feet or metres.
- Length of horizontal run in feet or metres.
- Input and output fitting type (WR1800, WR1500, WR1150, 8-3/16" 75 ohm, 6-1/8" 75 ohm or 6-1/8" 50 ohm).

Additional Information

For additional information, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1315B.

Attenuation and Average Power Ratings

Channel Number	Visual Carrier MHz	Attenuation dB/100 ft (dB/100 m)	Average* Power Kilowatts
		WC1750	
14	471.25	0.0521 (0.171)	386.9
19	501.25	0.0441 (0.145)	456.7
		WC1700	
20	507.25	0.0430 (0.141)	469.2
23	525.25	0.0399 (0.131)	504.5
		WC1750	
24	531.25	0.0391 (0.128)	515.6
41	633.25	0.0303 (0.099)	663.6
		WC1500	
39	621.25	0.0490 (0.161)	352.7
59	741.25	0.0381 (0.125)	453.4
		WC1350	
56	723.25	0.0530 (0.174)	293.9
69	801.25	0.0460 (0.151)	338.0

*Power rating for circular waveguide only; system power is limited by coaxial or rectangular waveguide components.

Standard Conditions

For Attenuation
VSWR 1.0, Ambient Temperature 24°C (75°F).

For Average Power
VSWR 1.0, Ambient Temperature 24°C (75°F). Waveguide Temperature 64°C (147°F).

Introduction

Andrew has been actively involved for nearly a decade in optical fiber research and the development of commercially viable polarization maintaining optical fiber and associated component products. Ongoing development work continues to enhance and broaden Andrew's capabilities to provide the user with advanced product concepts in this field. Increasingly, the focus is being placed on evolving applications products, primarily in the area of sensor subsystems.

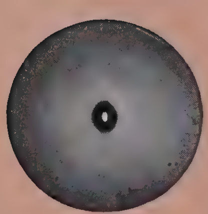
Polarization Maintaining Optical Fiber

Andrew Type 48280 E-Series optical fibers offer superior polarization preservation characteristics under adverse as well as nominal operating conditions. The former includes bending, twisting and wide range temperature changes which tend to defeat other polarization-maintaining optical fibers currently available.

To produce these fibers, Andrew employs a special process to create uniform elliptically-cored fiber with large index differences between the core and the cladding. This produces the high birefringence necessary to ensure superior polarization holding performance.

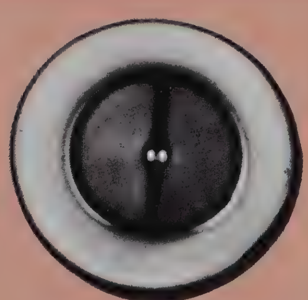
Typical applications include sensors for the detection of rotation, sound, strain, magnetic field and temperature. Other uses are for coupling to lasers and integrated optics where the elliptically-shaped core is an advantage, and for non-linear effects where high power densities are required in addition to polarization holding.

The fibers are metal coated to improve mechanical performance and to inhibit moisture penetration; further protection is provided by a plastic jacket. E-Series optical fiber can be optimized to customer wavelength requirements in the range from 633nm to 1550nm.



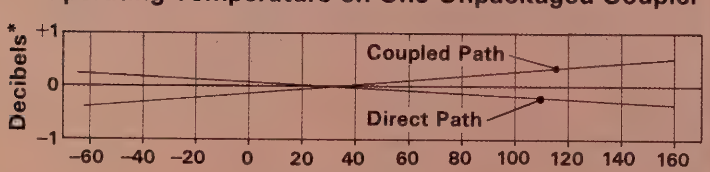
Polarization Maintaining Optical Fiber

D-Shaped Fiber



Polarization Maintaining Directional Coupler

Example Change in Polarization Extinction Ratio with Operating Temperature on One Unpackaged Coupler



*Room Temperature Extinction Ratio is Reference Level

Fiber Drawing Process Equipment

D-Shaped Optical Fiber

Andrew Type 205170 D-Series optical fibers combine the unique polarization holding characteristics of Type 48280 E-Series fiber with a specially designed cross-section. The fiber is D-shaped with the elliptical core having its major axis parallel to the flat of the D at a typical distance of 9μm. This construction allows the birefringent axes to be accurately located and provides for easy access to the guiding region.

Type 205170 fibers have specific applicability to those situations involving coupling, such as to laser diodes and integrated optics. As with E-Series fiber, a range of operating wavelengths may be specified.

Product Specifications

Type Number	
E-Series fiber	48280
D-Series fiber	205170
Operating Wavelength	633nm-1550nm
Composition	Natural silica
Diameter (850nm fiber)	
Fiber	70μm
Over metal coating	75μm
Over plastic jacket	120μm
Core Size (850nm fiber)	1 x 2mm ellipse
Core Centrality	±0.5% of fiber diameter
Minimum Bending Radius	0.5cm
Normalized Birefringence (B)	4 x 10^{-4}
Core/Cladding Index Difference	0.04
Numerical Aperture $(n_1^2 - n_2^2)^{1/2}$	0.34
Attenuation	
at 850nm	9 dB/km
at 1300nm	<3 dB/km
Polarization Holding (h)	50 dB·m (20 dB·km)

Directional Coupler

Fiber Optic Doppler Anemometer (FODA)

Polarization Maintaining Directional Couplers

In response to the growing need for single-mode, polarization-maintaining directional couplers for use as splitters and combiners in coherent sensing systems, Andrew has achieved a technical breakthrough resulting in the first truly reproducible device. Andrew's fused evanescent-wave couplers, made from polarization-maintaining D-Series fiber, deliver reliable performance and are highly compatible with other system components. The units have proven to be insensitive to the environments in which they are required to operate; this as a result of the guiding region being fully enclosed by the fibers themselves. Constructed of high silica content materials, they are extremely stable over the range of temperatures from –60°C to 150°C (–76°F to 302°F).

Product Specifications

Type Number (wavelength, nm)	**205550** (633); **206610** (780) **205552** (820); **205555** (850) **205551** (1300); **206456** (1550)
Operating Wavelength	633, 780, 820 to 850, 1300 and 1550 nm
Coupling Ratio (Standard)	1:1 ±0.1 dB
Temperature Stability (–60°C to 150°C)	
Coupling	0.004 dB/°C
Polarization Holding	±0.25 dB
Polarization Holding	>25 dB
Insertion Loss	≤0.3 dB
Directivity	60 dB
Packaging	
Stainless Steel Tube	2 mm OD x 48 mm
Color-coded leads encased in plastic sleeves	

Optical Fiber Polarizer

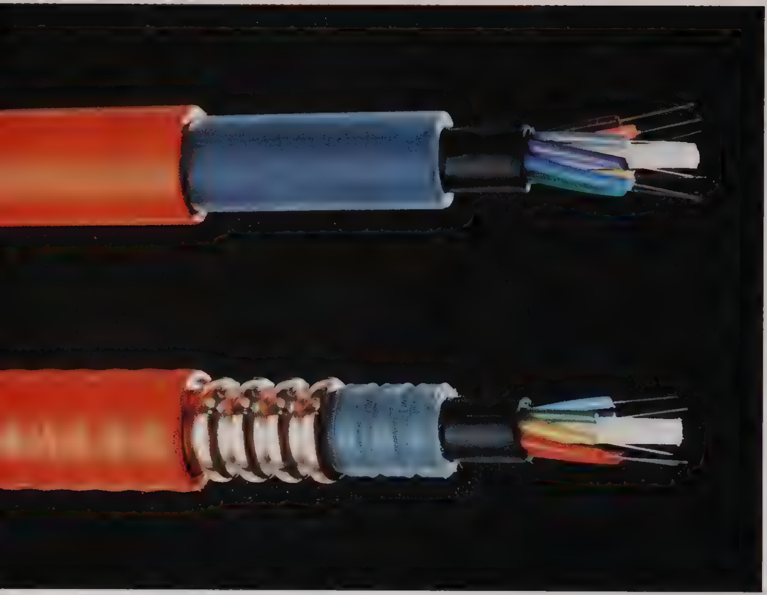
Andrew research has perfected the technique for constructing high performance/efficient polarizers from D-Series fiber. Production units with extinction ratios up to 40 dB and insertion losses of less than 1 dB are well within Andrew's capabilities. These devices exhibit stable polarization holding characteristics, similar to those specified for coupler products.

Constructed as they are from Andrew D-Series fiber, polarizers can be placed anywhere along the length of a fiber without splicing. This is a significant advantage in an application such as the production of Sagnac Rings for fiber gyros, or when used in conjunction with the Andrew coupler.

Optical Fiber Subsystems

The unique skills which Andrew has acquired in the process of developing its E- and D-Series fibers, and the associated polarization-maintaining components described above, are available to meet the needs of its customers with custom design services and specialized optical fiber subsystems. Development work is currently being carried out across a broad spectrum of applications. A number of Andrew subsystem products will be announced in the near future. These include a rotational sensor subsystem (Sagnac Ring) for fiber optic gyroscopes and a Fiber Optic Doppler Anemometer for particle sizing and for the investigation of interactions between particles.

For further information regarding Andrew Optical Fiber products and services, contact your local Andrew Sales Office listed on the inside back cover.



Fiber Optic Strander

Andrew has the capability and the experience to supply optical fiber cables for a wide variety of applications. Most commercially available fibers, up to twelve per cable, can be incorporated into the cable construction. Andrew offers custom-designed cables with customer-specified fibers and customer-specified cable construction. Cable designs can be developed which contain both optical and electrical conductors. Both all-dielectric and armored versions are available.

Manufacturing Facilities

Andrew has installed state of the art equipment for manufacturing fiber optic cables. This includes a Nokia fiber coating line and a Stollberger planetary stranding line. This sophisticated and precision equipment gives Andrew the capability to efficiently manufacture a wide variety of cable designs.

Custom Designed Cable

Andrew developed an optical fiber cable which meets the rigid performance requirements of the U.S. Department of Energy. Developed for underground nuclear testing applications, the cable offers exceptional tensile strength and impact resistance. The cable is suitable for applications where a very rugged, all-dielectric construction is required.

Each of the eight fibers is contained within a loose tube filled with a viscous material to allow for mechanical isolation of the fiber during bending and tensile loading of the cable. When installed, the cable may be loaded to the maximum service tension without any effect on the performance properties of the optical fibers. The tubes are helically wound about a fiberglass central strength member and then jacketed with a multi-layer polyolefin jacket for increased impact resistance. The standard outer jacket is an orange, UV stabilized polyethylene. The cable is completely filled and sealed in such a way that it is impervious to the migration of liquid or gas along its length.

Optional Configurations

The basic cable developed for the DOE, described above, is suitable for a wide variety of applications. The cable can accommodate up to a quantity of eight of almost any available optical fiber, including single mode, multimode, 100 micron core, radiation, hardened and mixed types. Where required, the cable can be armored with a seam-welded and corrugated copper sheath without changing the optical properties. Lengths are available up to 6 km. Other jacketing colors are available on request.

Following are characteristics of the cable supplied to the U.S. Department of Energy:

Cable Characteristics

Outer Diameter	0.625 in (16 mm)
Number of Fibers	8 Maximum*
Cable Weight	0.16 lb/ft (0.24 kg/m)
Cable Length	6560 ft (2000 m)

*Less than 8 may be used in the same construction by substituting nylon monofilament.

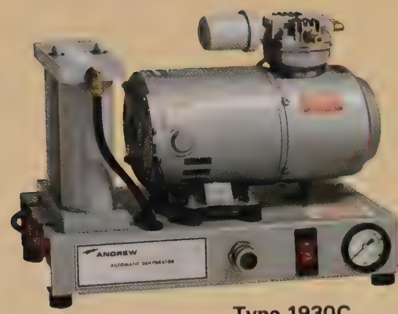
Mechanical Performance

Impact Resistance	10 Impacts at 7.4 ft-lb (10 N · m)
Maximum Service Tension	600 lb (2670 N)
Maximum Tension During Installation	1100 lb (4890 N)
Minimum Bend Radius	8 in (200 mm)
Bending Moment	2.5 ft-lb (3.4 N · m)
Number of Reverse Bends on the Minimum Bend Radius	50

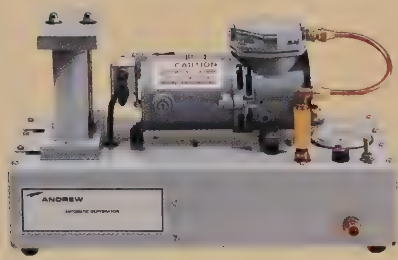
Fiber Characteristics

Fiber Supplier	Corning	Corning
Cable Type No.	45040-8	45040-9
Type	Graded Index (Multimode)	Graded Index (Multimode)
Core/Cladding Diameter (Microns)	50/125	50/125
Numerical Aperture	.20	.20
Attenuation at 850 nm	3.5 dB/km	3.5 dB/km
Bandwidth at 850 nm	400 MHz-km	1300 MHz-km

Type 1920E



Type 1930C



Type 78200

Type 40525A

Type 65630B

All air-dielectric waveguides, coaxial cables and rigid lines should be maintained under dry gas pressure to prevent electrical performance degradation. If a constant positive pressure is not maintained, "breathing" can occur with temperature variations. This permits moisture to enter the line causing increased attenuation, increased VSWR, and a path for voltage breakdown. Andrew offers a full line of dehydrators and pressurization accessories. For additional information on pressurization, ask for Bulletin 1066.

Dehydrator Types

Automatic Dehydrators automatically regenerate the desiccant, eliminating downtime and assuring output of uniform dryness. Two adsorption drying chambers are alternately cycled every 30 seconds. While one chamber is drying the air passing through it, the other chamber is being purged of accumulated moisture.

Andrew offers three automatic dehydrators. The **1920E** and **1930C** series are AC (alternating current) models and differ in output capacity. The **78200** series operates on 24V or 48V DC (direct current).

Manually Regenerated Dehydrators. Manually regenerated dehydrators require periodic inspection and replacement or regeneration of the desiccant. Andrew offers two basic types which differ in output pressure and capacity.

The **40525A** series can supply approximately 100 standard ft^3 (3000 litres) of dry air under typical ambient conditions of 40% R.H. and 21°C (70°F) before regeneration is required.

Types **65630B** and **163903** can supply approximately 270 standard cubic feet (7646 litres) of dry air under the same ambient conditions.

The frequency of regeneration depends on the leakage rate of the system. For a small system, the regeneration cycle may be more than a year. However, frequent inspection is necessary because a leak could suddenly develop and exhaust the desiccant in only a few hours.

Saturated desiccant can be reactivated during dehydrator downtime, replaced by new desiccant and discarded, or replaced by new reactivated desiccant and saved for reactivation at a more convenient time or location. Reactivation requires heating the desiccant to 180°C (350°F) for four hours in an ordinary oven. See page 284 for desiccant replacement information.

Horn-Reflector Antenna System dehydrators, described on page 280, supply a large volume of air at very low pressure.

Dehydrator Selection

Selection of a dehydrator for a pressurization system is primarily based on the volume of dry air which has to be supplied, the pressure rating of the system and the available electrical power. The volume is governed by the size of the line requiring pressurization, its length and the anticipated leak rate of the system.

Pressure Limits

The pressure inside a transmission line system should be maintained at a positive level and below the maximum pressure rating of all components. Most components have a rating of 10 lb/in^2 (70 kPa). Pressurization in the 3 to 8 lb/in^2 (21 to 55 kPa) range is recommended for these systems.

The **1920E** and **1930C** series automatic dehydrators are factory-set to start when the pressure drops to 3 lb/in^2 (21 kPa) and stop when a pressure of 8 lb/in^2 (55 kPa) is attained. Pressurization above 10 lb/in^2 (70 kPa) is not recommended.

Systems utilizing automatic dehydrators should be designed such that the dehydrator runs no more than 72 minutes and no less than 10 minutes during a 24 hour period.

Some components such as horn antennas, large circular waveguides, rectangular waveguides, and large antenna feed windows will be distorted or damaged by pressures in this high range. A low-pressure dehydrator or a standard dehydrator and a regulating tank must be selected to maintain the lower pressures required by such components, typically 0.5-3.0 lb/in^2 (3.4-21 kPa). Horn antennas require very low pressure (0.2 lb/in^2 (1.4 kPa)) systems capable of providing very large volumes. See page 280 for recommended systems.

The tables below can be used as a guide for dehydrator selection. For the Types **1920** and **1930**, capacity is based on a two-hour initial pressurization period. The capacity of the Type **40525A** dehydrator is based on a 0.5 lb/in^2 (3.4 kPa) pressure loss per day and a 90-day desiccant replacement cycle, with typical ambient conditions of 40% relative humidity and 21°C (70°F).

For further information on dehydrator selection, contact your local Andrew Sales Office listed inside the back cover and request Bulletin 1066.

Typical Dehydrator Capacities for Pressurizing Transmission Lines*

Transmission Line	1920E Series Length, ft (m)	1930C Series Length, ft (m)	40525A Series Length, ft (m)	65630B Series Length, ft (m)	78200 Series Length, ft (m)
3.7 GHz and higher waveguide	13600 (4145)	2100 (637)	1500 (450)	†	1260 (384)
1.7-3.7 GHz waveguide	4000 (1220)	620 (189)	460 (140)	†	372 (113)
1-5/8" and smaller coaxial	20500 (6428)	3100 (960)	2300 (710)	†	1860 (567)
3" coaxial	7800 (2377)	1200 (366)	890 (271)	†	720 (219)
4" coaxial	4100 (1250)	630 (192)	460 (142)	†	378 (115)
5" coaxial	2400 (732)	370 (115)	280 (85)	†	222 (68)
6-1/8" rigid coaxial	1400 (451)	220 (67)	170 (151)	†	132 (40)
8-3/16" rigid coaxial	830 (252)	120 (37)	94 (29)	†	72 (22)
Larger circular waveguide					
WC1350	1150 (350)	—	—	†	—
WC1500	930 (284)	—	—	†	—
WC1700	720 (221)	—	—	†	—
WC1750	680 (209)	—	—	†	63 (19)

*See text for parameters used.

† Recommended for low pressure, low volume systems.

Dehydrator Selection

Dehydrator Series	AC** or DC**	Type of Regeneration	Duty Cycle Stop Pressure lb/in^2 (kPa)	Duty Cycle Start Pressure lb/in^2 (kPa)	Output Capacity ft^3/min (l/min)
1920E	AC	Automatic	8 (55)	3 (21)	1.3 (36)
1930C	AC	Automatic	8 (55)	3 (21)	0.20 (5.7)
40525A-1, -2, -3	AC	Manual	8 (55)	3 (21)	0.90 (25)
40525A-4, -5	AC	Manual	5 (34)	1 (7)	0.90 (25)
65630B, 163903	AC	Manual	0.4 (2.8)	0.3 (2.1)	0.03 (0.94)
78200-24, -48	DC	Automatic	3 (21)	1 (7)	0.12 (3.4)

**See page 279 for details.

Dehydrator Characteristics

	1920E	1930C	40525A	78200	65630B** and 163903**
Electrical					
Power Consumption, VA, Operating Standby	1100 10	400 0.5	300 0	68 0	5 0
Mechanical					
Output Capacity, * ft^3/min (litres/min)	1.3 (36)	0.20 (5.7)	0.90 (25)	0.12 (3.4)	0.03 (0.94)
Ambient Inlet Temperature	0° to 32°C (32° to 90°F)	0° to 32°C (32° to 90°F)	0° to 32°C (32° to 90°F)	0° to 32°C (32° to 90°F)	0° to 32°C (32° to 90°F)
Ambient Humidity, percent	95	95	95	95	95
Output Dew Point, below	–40°C (–40°F)	–40°C (–40°F)	–35.6°C (–32°F)	–40°C (–40°F)	–36°C (–32.8°F)
Output Connection, female	1/8" pipe thread	1/8" pipe thread	1/8" pipe thread	1/8" pipe thread	1/8" pipe thread
Output Tubing	20 ft of 3/8" dia. (6 m of 9 mm dia.)	20 ft of 3/8" dia. (6 m of 9 mm dia.)	20 ft of 3/8" dia. (6 m of 9 mm dia.)	20 ft of 3/8" dia. (6 m of 9 mm dia.)	20 ft of 3/8" dia. (6 m of 9 mm dia.)
Net Weight, lb (kg)	80 (36)	40 (18)	21 (9.5)	18 (8)	19 (8.6)
Shipping Weight, lb (kg)	90 (41)	47 (21)	25.5 (11.5)	28 (12.7)	22 (10)
Dimensions, H x W x D in (mm)	15.3 x 18.5 x 14.5 (390 x 470 x 370)	13.2 x 7.2 x 14.9 (335 x 180 x 375)	12.5 x 5 x 16 (320 x 130 x 410)	12 x 7 x 14 (305 x 178 x 356)	12.25 x 19 x 7† (310 x 483 x 128)

*Output capacity of 50 Hz units is approximately 17% lower.
†Mounts in 19 inch equipment rack.
**Low pressure alarm contacts built in.

Dehydrator Ordering Information

Type numbers are given in the table below. Each dehydrator includes a grounded power cord and 20 ft (6 m) of 3/8" polyethylene tubing with two 1/8" straight male pipe thread fittings for attachment to the dehydrator and manifold or transmission line. The 65630B dehydrator includes one 1/8" straight male pipe thread fitting.

Dehydrator Type Numbers

Electrical Input	1920E Series	1930C Series	78200 Series	40525A Series	Low Pressure*	Low Pressure**
120V, 60 Hz	1920E	1930C	—	40525A	40525A-4	65630B
120V, 50 Hz	1921E	1931C	—	40525A-2	—	—
230V, 50 Hz	1924E	1934C	—	40525A-3	40525A-5	163903
24V, dc	—	—	78200-24	—	—	—
48V dc	—	—	78200-48	—	—	—

*5 lb/in² (34 kPa) **0.4 lb/in² (2.8 kPa)

Spare Parts

Description	For Dehydrator Types	Type No.
Compressor Repair Kit*	1920E, 1921E, 1924E	**39878**
Compressor Repair Kit*	1930C, 1931C, 1934C	**40486**
Compressor Repair Kit**	40525A Series	**39795-2**
Compressor Repair Kit**	78200-24 Series	**78199-24**
Compressor Repair Kit**	78200-48 Series	**78199-48**
Replacement Desiccant	40525A Series	**210**

*Includes gaskets, rings, seals and valves.
**Includes gasket, valves, muffler and filter.

Pressurization System for Horn Reflector Antennas

Type 48921 Lectrodryer* Dehydrator is offered by Andrew for pressurization of SHX® super high performance antenna systems. The unit supplies dry air continuously and maintains system pressure within a preset range. The dehydrator consists of a regenerative blower, a heat reactive dual tower, and desiccant. It is capable of pressurizing up to three horn antenna systems, depending on the connecting waveguides. Low pressure and high humidity alarm lights are displayed on the control panel. The alarms are activated if pressure drops below a preset point or if relative humidity of the outlet air rises above 4%. The control panel also includes a pressure gauge and a circuit breaker for overcurrent protection and on-off service.

Pressurization Kit for use with the horn system dehydrator. Includes a six-port manifold, 80 ft (25 m) of 1/2 in diameter polyethylene tubing, straight and right angle fittings for six tubing runs, power cord and accessories. .... Type **48094**

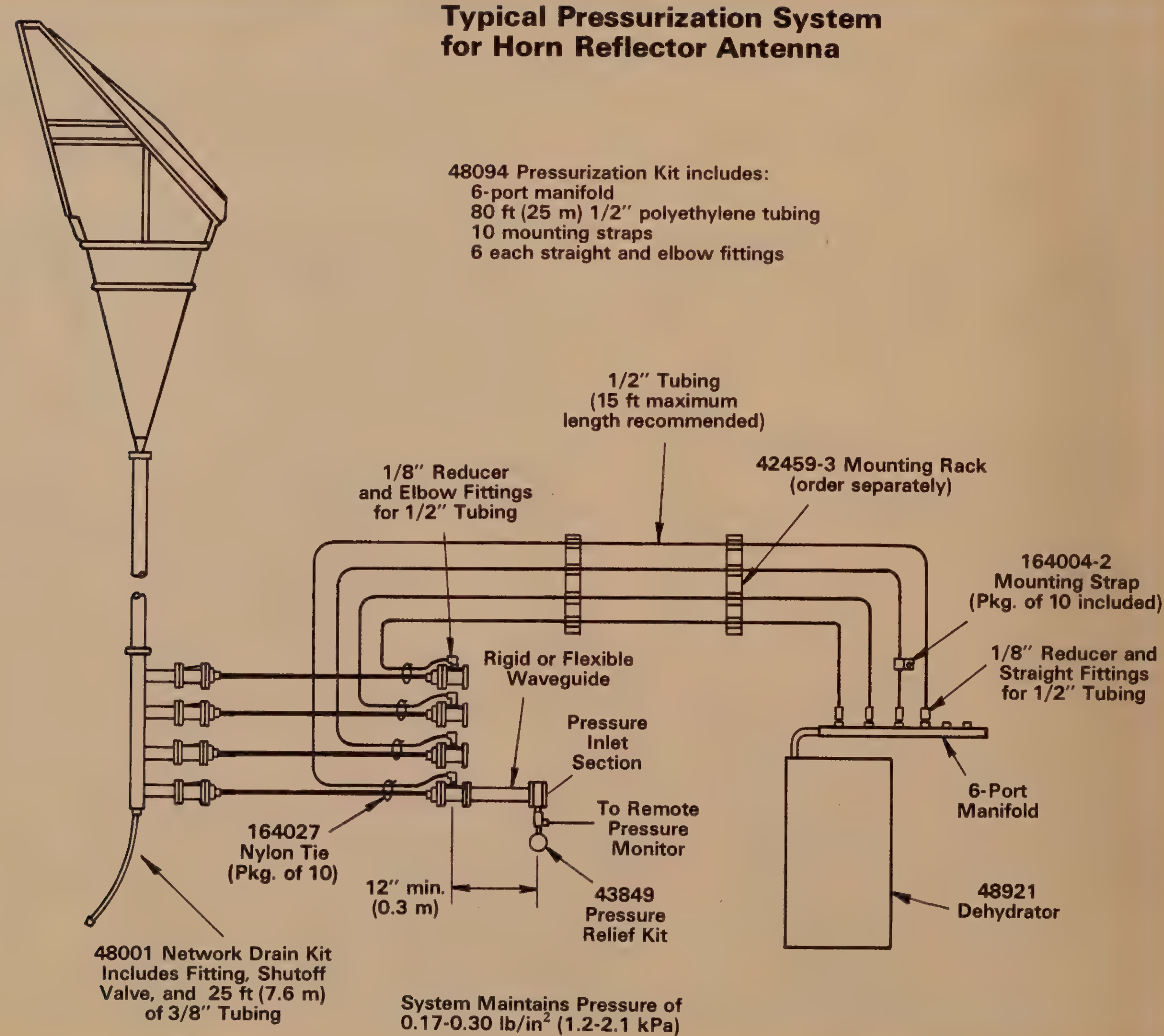
*Registered trademark of Ajax Magnethermic Corp.

Lectrodryer Dehydrator Characteristics

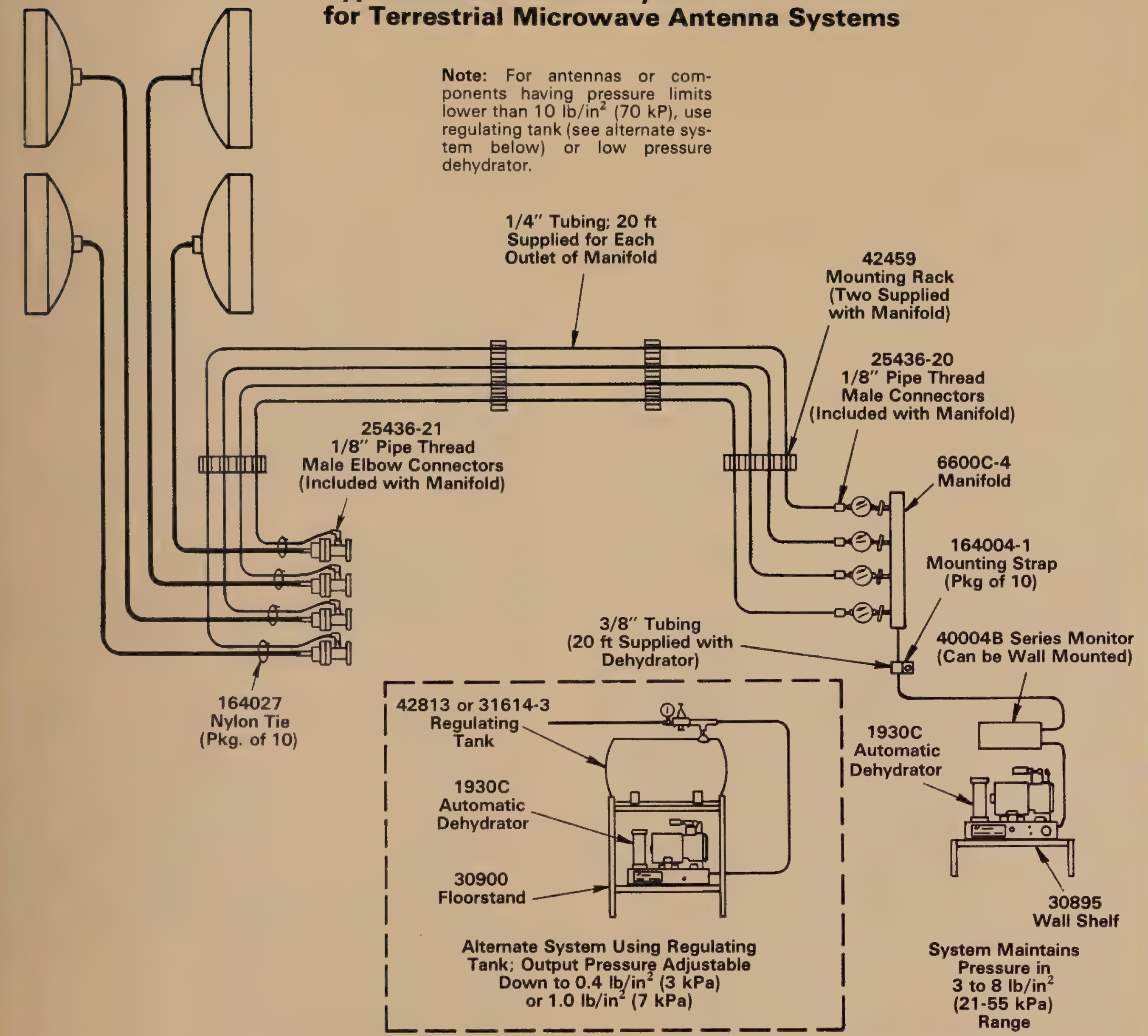
Electrical Input	120V, 60 Hz
Power Consumption, watts	1000
Output Capacity, ft^3/min	2.1
(litres/min)	(59)
Pressure Range, lb/in^2	0.17 – 0.30
(kPa)	(1.2 – 2.1)
Output Dew Point, below	–40°C (–40°F)
Alarms included	Low Pressure High Humidity
Net Weight, lb	300
(kg)	(136)
Dimensions, W x D x H, in	24 x 15 x 60
(mm)	(610 x 380 x 1525)

Pressure Relief Kit. Relief valve prevents high pressure in the antenna caused by sudden pressure increase due to temperature change. One required per antenna. .... Type **43849**

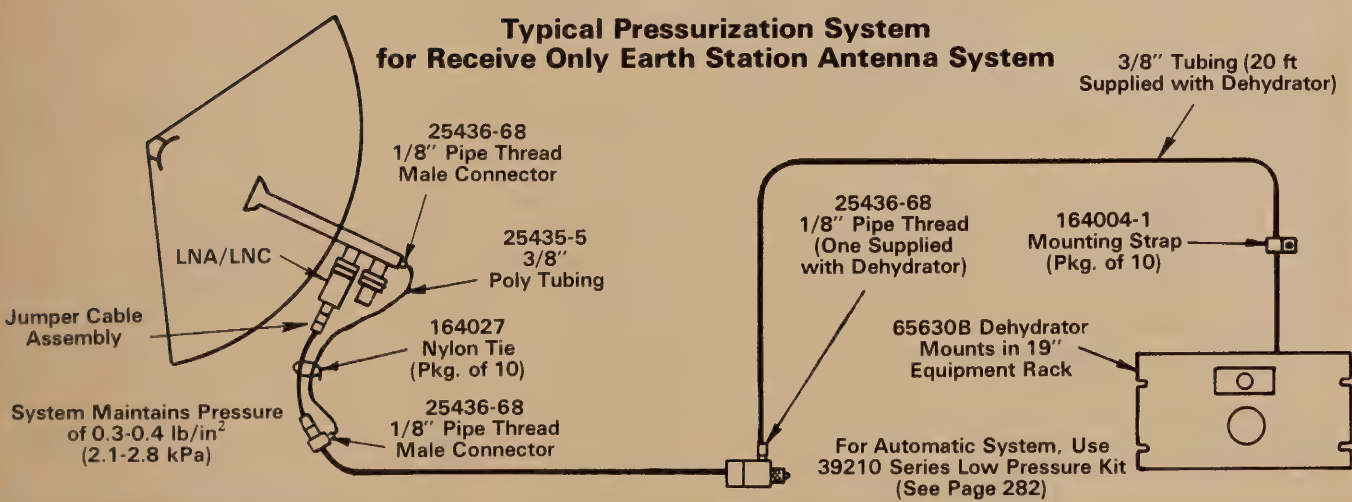
Typical Pressurization System for Horn Reflector Antenna



Typical Pressurization System for Terrestrial Microwave Antenna Systems



Typical Pressurization System for Receive Only Earth Station Antenna System



Low-Pressure Systems

The following equipment is designed for low-pressure, low-volume systems. Earth station and LD ( )-122 series local distribution antenna systems are typical applications, For medium and high volume systems, the dehydrators on page 277 combined with the regulating tanks on page 283 are recommended.

Both pressure and dew point requirements must be considered when selecting a pressurization system for an earth station antenna. Most Andrew earth station antennas have relatively large aperture feed windows which have a maximum pressure rating of 1 lb/in^2 (7 kPa). Pressurization systems used with these antennas must have a pressure relief valve which limits the system pressure to the feed window rating. Also, the LNA manufacturer should be contacted to determine the dew point requirements of the pressurization medium to prevent condensation on thermoelectrically cooled elements, and to determine if the input to the LNA is pressure tight.

The following pressurization systems supply dry air or nitrogen at 0.4 lb/in^2 (3 kPa). They are equipped with high-pressure relief valves which limit system pressure to a maximum of 1 lb/in^2 (7 kPa).

Low Pressure Manual Reactivation Dehydrator, Types 65630B and 163903, for small internal volumes at low pressures are described on pages 277-279.

A Low Pressure Wall-Mount Regulator, is used to reduce the pressure of existing microwave pressurization systems (typically 3 to 8 lb/in^2), to 0.4 lb/in^2 (3 kPa). The regulator is supplied with 20 ft (6 m) of 3/8" tubing and required fittings for tapping into an existing pressurization system .... Type **42996A**

B Low Pressure Nitrogen Tank Fitting. Includes a wall-mount regulator, Type 42996A (described above) and a regulator assembly with high- and low-pressure gauges for direct attachment to a nitrogen tank with a CGA 580 (0.965" right-hand internal) connection. It is supplied with 20 ft (6 m) of 3/8" tubing and 1/8" male pipe thread fittings for attachment to the HELIAX cable or waveguide connectors .... Type **42969**

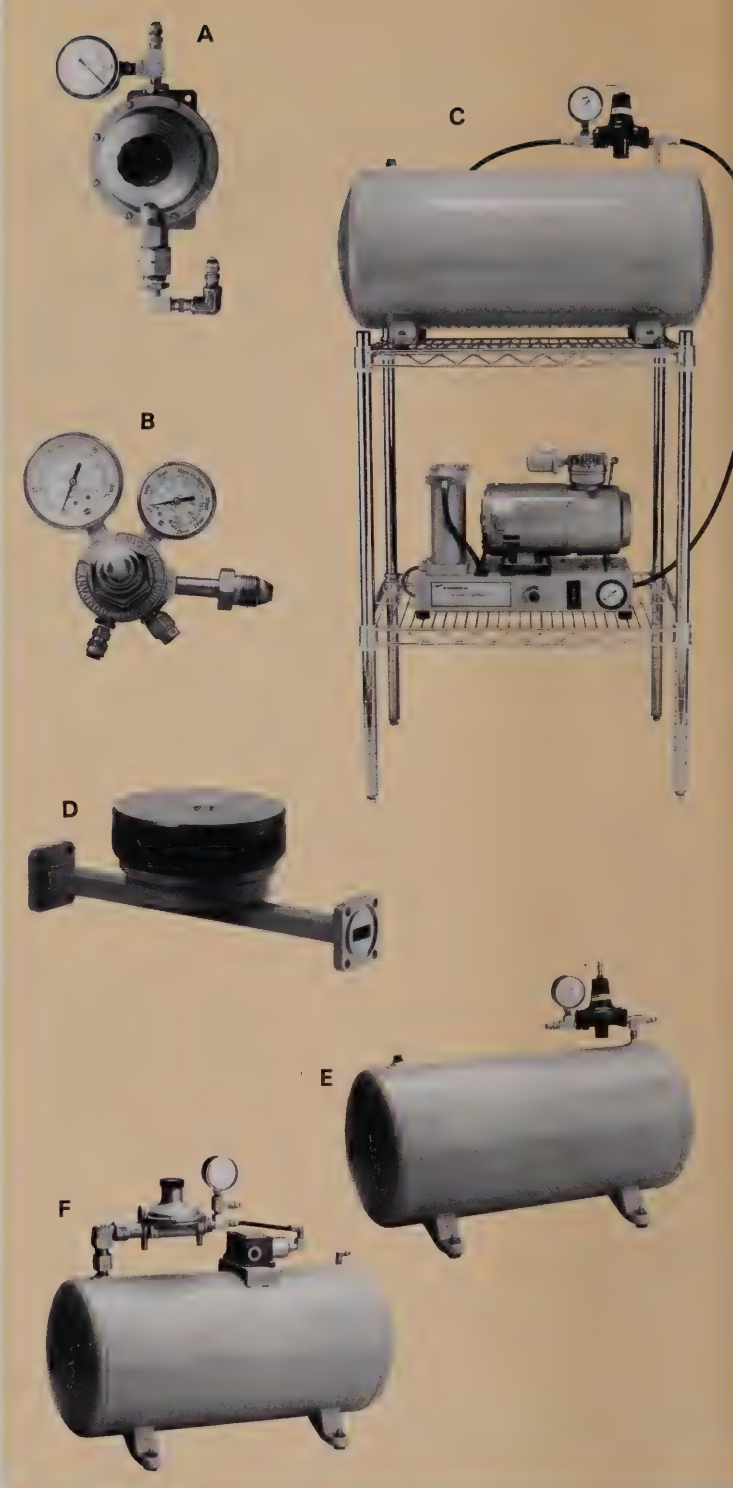
C Low Pressure Kit for ESA Systems. Includes a 1930C Series dehydrator, 42813 low pressure regulating tank, 30900 floor stand and polyethylene tubing.
120V, 60 Hz .... Type **39210**
230V, 50 Hz .... Type **39210-2**

D Static Desiccators. Static desiccators eliminate moisture condensation in compact radio systems such as those where radio equipment is mounted to the antenna mounting mast.

The unit consists of a desiccator attached to a short section of standard waveguide which is fitted with standard flanges. This permits in-line installation at the rear of the antenna.

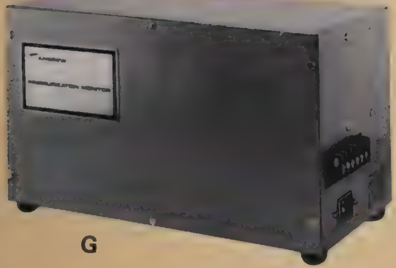
In systems with feeder lengths of less than 3.5 ft (1 m), the unit provides an inexpensive and effective method of supporting dry air conditions in the waveguide with a minimal amount of maintenance.

A color indicator on the desiccator shows the state of the desiccant at a glance. When exhausted, the desiccator is simply un-screwed, the desiccant replaced using a refill pack, Type **107112**, and the desiccator screwed back into place.



Static Desiccator Unit Selection

Type	Waveguide	Flanges Mate with
107238-21	WR137	CPR137G, PDR70
107238-22	WR137	UG-343B/U, UG-344/U, PAR70
107238-23	WR112	CPR112G, PDR84
107238-24	WR112	UG-51/U, PBR84
107109-21	WR90	CPR90G, PDR100
107238-25	WR75	PDR120
107238-26	WR75	WR75 choke or cover, PBR120
107238-27	WR62	PDR140
107238-28	WR42	UG-595/U, UG-596A/U, PBR220



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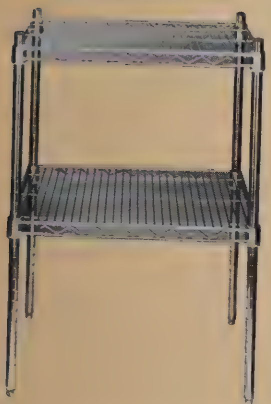

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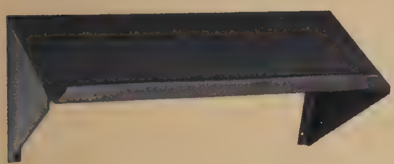

E Regulating Tank. Used with dehydrators to prevent excessive cycling when pressurizing systems with a low internal volume, such as 1/2" and 7/8" cables, or a large system fed through a reducing valve. Also used for 2 or 4 GHz systems requiring 5 lb/in^2 (34 kPa) maximum pressure. The tank has a 1.5 ft^3 (42 litre) capacity and is supplied with a 0 – 5 lb/in^2 gauge. The regulator may be adjusted down to 1.0 lb/in^2 (7 kPa) output pressure. Required fittings and 15 ft (4.6 m) of 3/8" polyethylene tubing are included .... Type **31614-3**

F Low Pressure Regulating Tank for use in UMX® multiband or earth station antenna systems. Prevents excessive cycling when pressurizing systems with a low internal volume. Equipped with regulator which reduces output pressure to 0.4 lb/in^2 (3 kPa). Relief valve releases air when system pressure exceeds 1 lb/in^2 (0.7 kPa). Includes 0 – 20 oz/in^2 pressure gauge, 20 ft (6 m) of 3/8" polyethylene tubing and one male connector .... Type **42813**

G Pressurization Monitor, activates Form C dry contacts for remote warning light or alarm (not supplied) when pressure is less than 1.5 lb/in^2 (10 kPa) or higher than 10 lb/in^2 (70 kPa), or when relative humidity in the system reaches 10%. Types 40004B-5, -6 and -7 include a timer which activates contacts in case of excessive dehydrator operation. Order from table below.

H Low Pressure Dehydrator Control/Monitor. Used to operate two dehydrators when high volume output is needed. Recommended for use in UHF circular waveguide systems. Activates internal dry contacts for remote warning light or alarm (not supplied) operation when pressure is less than .5 lb/in^2 (3.4 kPa) or higher than 1.9 lb/in^2 (13 kPa) or when relative humidity in the system reaches 10%. A timer activates internal contacts in case of excessive dehydrator operation .... Type **163305**

J Floor Stand. For 1920E and 1930C series dehydrators and regulating tanks. Includes two shelves 17.75 in by 23.3 in (450 x 590 mm). Height is 31 in (800 mm). Posts are equipped with leveling legs ... Type **30900**

K Wall Shelf. Can also be mounted to a 19 in equipment rack.
For 1930C and 40525A .... Type **30895**
For 1920E .... Type **30896**

L Dry-Air Hand Pump. Designed to pressurize small-capacity systems. The pump is supplied with a desiccant condition indicator, silica gel, and hose .... Type **878A**
Spare hose for Type 878A .... Type **10195**
Silica gel refill (one required) .... Type **210**

Pressurization Monitor Ordering Information

Type	40004A	40004A-2	40004A-3	40004A-4	40004B-5	40004B-6	40004B-7
Low Pressure Sensor (1.5 lb/in^2)	X	X	X	X	X	X	X
High Pressure Sensor (10 lb/in^2)	X	X	X	—	—	X	X
Humidity Sensor (10% RH)	X	X	—	—	—	X	X
High Pressure Relief (10 lb/in^2)	—	—	—	—	X	—	—
Dehydrator Timer	—	—	—	—	X	X	X
Voltage	120V 60 Hz	230V 50 Hz	—	—	120V 60 Hz	120V 60 Hz	230V 50 Hz
Net Weight, lb (kg)	8 (3.6)	8 (3.6)	7 (3.2)	6 (2.8)	8 (3.6)	10 (4.5)	10 (4.5)
Shipping Weight, lb (kg)	11 (4.9)	11 (4.9)	10 (4.5)	8 (3.7)	11 (4.9)	12 (5.4)	12 (5.4)

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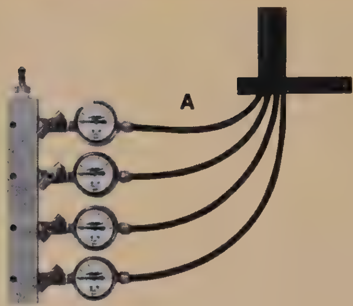

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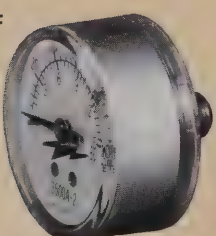

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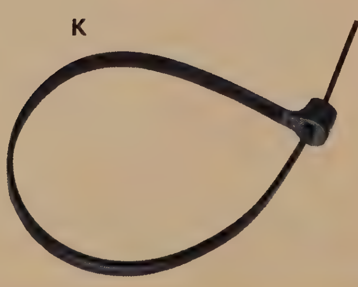


A Gas Distribution Manifolds include a pressure gauge, shut-off valve, fittings and 20 ft of 1/4" polyethylene tubing for each outlet. Units can be stacked together to achieve additional outlets. Pressure gauge ranges are 0 – 15 lb/in² for standard units and 0 – 5 lb/in² for low-pressure units.

Number of Outlets	Standard Type No.	Low Pressure Type No.
2	6600C-2	L6600C-2
4	6600C-4	L6600C-4
6	6600C-6	—

B Pressure Sensor Switch. Activates remote warning light or alarm when system pressure goes below 1.25 lb/in² (8.6 kPa). Includes 1/4" nipple mounting to top of 6600C series manifold .... Type **31618-4**

C Nitrogen Tank Fitting. Fits a **CGA580** (0.965 in right-hand internal) connection to a nitrogen tank. Included are a pressure regulator, high and low-pressure gauges, and 10 ft (3 m) of 3/8" polyethylene tubing and 1/8" pipe thread fittings .... Type **858C**

Adaptor to fit a CGA550 (0.903 in left-hand external) nitrogen tank connection .... Type **35751**

D Gauge Assembly includes a pressure gauge, gas inlet valve and tee with 1/8" male pipe thread. For all waveguide sizes and cable sizes up to 1-5/8", 0-30 lb/in² (0-200 kPa) .... Type **18991A-1**
For 3" and larger cable, 0-15 lb/in² (0-100 kPa) .... Type **18991A-2**

E Pressure Gauge. 1/8" male pipe thread. Indoor use only.
0 – 15 lb/in² (0 – 100 kPa) .... Type **3500A**
0 – 5 lb/in² (0 – 35 kPa) .... Type **33117-2**

F Pressure Gauge. 1/8" male pipe thread. Indoor use only with 6600C series manifolds.
0 – 15 lb/in² (0 – 100 kPa) .... Type **3500A-2**
0 – 5 lb/in² (0 – 35 kPa) .... Type **33117-5**

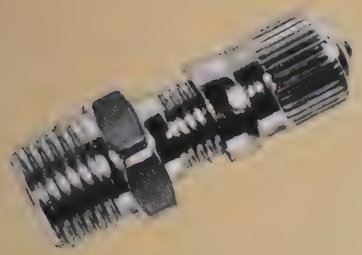
G Mounting Rack for polyethylene tubing
For 1/4" .... Type **42459**
For 1/2" .... Type **42459-3**

H Mounting Strap for polyethylene tubing
For 3/8", pkg. of 10 .... Type **164004-1**
For 1/2", pkg. of 10 .... Type **164004-2**

J Polyethylene Tubing, specify length in feet or metres
1/4" .... Type **25435-4**
3/8" .... Type **25435-5**
1/2" .... Type **25435-8**

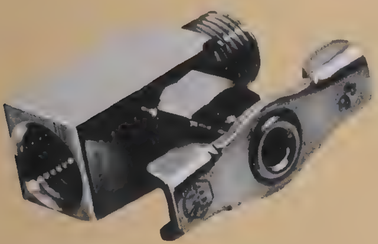
K Nylon Tie Kit of 10 pieces. For securing polyethylene tubing directly to interior waveguide runs and support members .... Type **164027**

Silica Gel Refill. (Not illustrated) For Type **878A** (one can) or Type **40525A** dehydrator (two cans) .... Type **210**



Gas Inlet Valve has male pipe thread.
1/8″ . . . . Type **3017**
1/4″ . . . . Type **3017-2**

Release Valve has 1/8″ male pipe thread . . . . Type **3027**

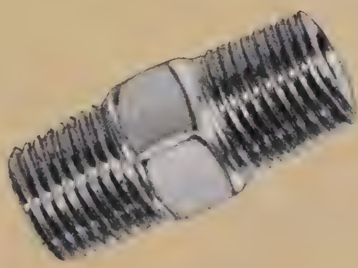


Shut-off Valve has 1/8″ pipe threads, male one end, female other end . . . . Type **4949**

Pipe Tee has 1/8″ female pipe thread each outlet . . . . Type **3028**

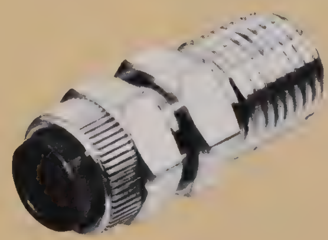
The 1/8″ and 1/4″ pipe threads used on the fittings described on this page mate with both U.S. and international pipe threads. All gas input connections on Andrew pressurizable components are 1/8″ female.

Street Tee has one male and two female 1/8″ pipe thread outlets . . . . Type **3022**

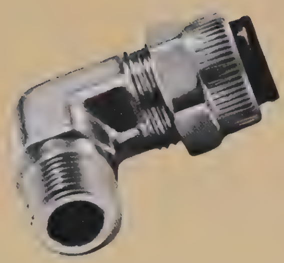


Hex Pipe Nipple, has male thread both ends.
1/8″ . . . . Type **25436-42**
1/4″ . . . . Type **25436-52**

Male Connector for polyethylene tubing, with 1/4″ male pipe thread.
For 1/4″ tubing . . . . . Type **25436-61**
For 3/8″ tubing . . . . . Type **25436-63**

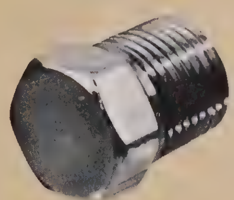


Male Connector for polyethylene tubing, with 1/8″ male pipe thread.
For 1/4″ tubing . . . . . Type **25436-20**
For 3/8″ tubing . . . . . Type **25436-68**
For 1/2″ tubing . . . . Type **25436-84***

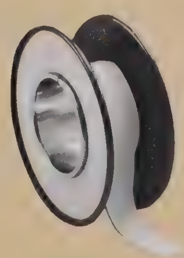


Elbow for polyethylene tubing, with 1/8″ male pipe thread.
For 1/4″ tubing . . . Type **25436-21**
For 3/8″ tubing . . . . Type **25436-4**
For 1/2″ tubing . . . Type **25436-85***

Tubing Tee for polyethylene tubing.
For 3/8″ tubing . . . Type **25436-81**
For 1/4″ tubing . . . Type **25436-519**



Pipe Plug has 1/8″ male pipe thread . . . . Type **3018**



Teflon Tape for sealing threaded joints. 7.5 ft (2.2 m) length . . . . Type **3012A**

*Has 3/8″ male pipe thread. Use with Type 25436-83, 3/8″ to 1/8″ reducer ordered separately.

GRASIS® Towers

Andrew offers a complete range of custom-designed GRASIS* guyed and self-supporting towers. Andrew has the engineering expertise, manufacturing facilities and experienced field service personnel to provide you with a top quality tower system. For more information on Andrew's complete field service capabilities, refer to page 43.

Tower Models

Andrew offers four guyed tower models and five self-supporting tower models to meet any application from light-duty cellular radio and land mobile radio to applications which require extremely heavy antenna loading.

Attention to Detail

A quality tower installation is ensured by the care, expertise and comprehensive capabilities Andrew provides each project.

Professional Engineering Capabilities. Andrew's staff of professional registered engineers has more than 200 years of combined experience in tower erection and application. Each tower project is assigned to a staff engineer whose exclusive responsibility is to design the most economical tower within EIA standards or the customer's guidelines, whichever are most stringent. Requirements corresponding to anticipated applications are integrated into the design. Project engineers also provide assistance with writing specifications and supplying information for zoning and building permits.

Research and Development. In addition to our tower project engineers, Andrew employs a full-time engineering staff dedicated to tower design research and development, helping make Andrew the leader in providing the most up-to-date and cost-effective tower products.

Upgrade Expandability. Andrew can analyze an existing tower and recommend the modifications necessary to adapt it for expanded applications. Andrew angle members can be reinforced and strengthened to meet any unforseen loading requirement. Additional reinforcing capabilities are not available with towers using tubular components.

In-house galvanizing at Andrew's Fayetteville facility allows for complete quality control of tower component manufacturing throughout the process.

Registered professional engineers use computer-aided analysis to design and optimize each tower.

Standard Features

All-Bolted Construction. The all-bolted construction of Andrew towers minimizes freight costs and readily accommodates future modifications and fast, easy replacement of tower members.

Internal Climbing Ladder. Each tower is supplied with a climbing ladder mounted so that two tower faces form a safety cage. The bracing system of the R24 guyed tower serves as a climbing device. Each LST Series tower is supplied with step bolts.

FAA Requirements. Paint and tower lighting systems are available as required by the FAA. Refer to page 299 for information on Andrew's GLC Light Controller.

Lightning Protection. A grounding system meeting the latest EIA standards is provided. Lightning rod and special grounding systems are available upon request.

Assured Quality Control. All tower components are hot-dip galvanized, certified structural steel. Andrew obtains certification on the physical and chemical characteristics of all steel used for its towers.

In order to maintain proper quality control, Andrew features its own in-house galvanizing at our ultra-modern metal fabrication and galvanizing facility in Fayetteville, Arkansas. A 30-foot dip tank affords Andrew generous galvanizing capacity, and allows for efficient, proper treatment of both angular and tubular components.

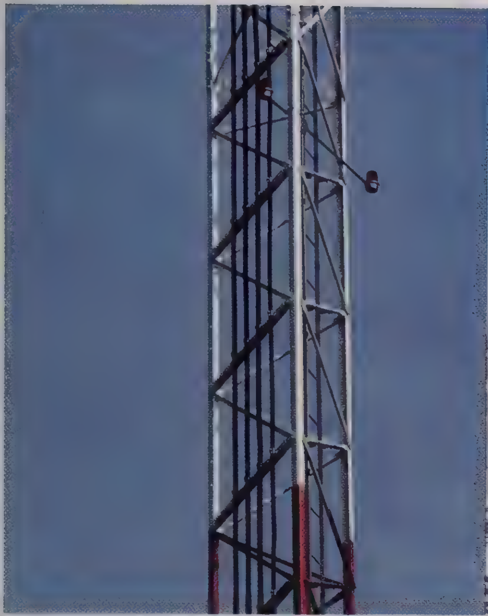
Tower Selection

Three factors affect tower selection:

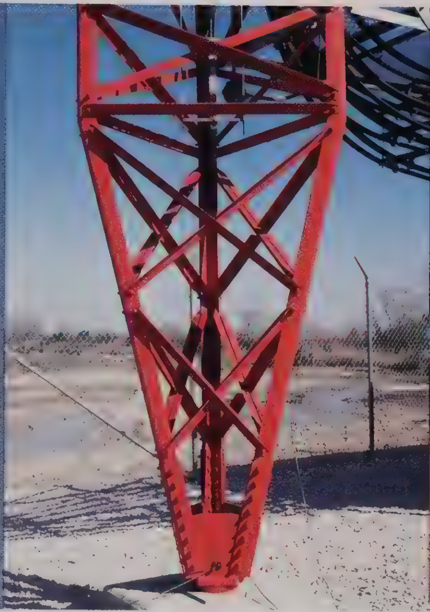
– **Land Requirements.** Guyed towers generally require more land than self-supporting towers. For example, a 250 ft (76 m) guyed tower would require more than four acres, while a 250 ft (76 m) self-supporting tower requires less than one acre. For assistance in determining land requirements for guyed towers, refer to pages 290-291. For more plot size information on Andrew self-

*Grasis is the registered trademark under which towers, shelters and related products are sold by Andrew.

Guyed Towers



Waveguide support members are built in to every Andrew guyed tower. Between seven and 14 feeders can be accommodated.



All Andrew guyed towers utilize articulated base design as shown here to prevent bending moment due to translation forces developed between the foundation and the tower.

Formed plate legs (above) provide superior strength and straightness. Andrew guyed towers use flexible anchor shafts (below) to dampen guy vibrations caused by wind gusts. Formed plate legs are used on all Andrew towers except the LST Series self-supporting tower.

supporting towers, contact your local Andrew Sales Office listed on the inside back cover and request the following bulletins:

KST – Bulletin 8748	LST2 – Bulletin 8745
3ST – Bulletin 8749	LST3 – Bulletin 8746
LST1 – Bulletin 8744	LST4 – Bulletin 8747

– **Cost Comparison**. Guyed towers typically cost less than self-supporting towers due to reduced steel usage. Most self-supporting foundation types are more costly than guyed tower foundations. Erection time for guyed towers is generally less than for self-supporting towers.

– **Maintenance**. In general, self-supporting towers require less maintenance. It is recommended guyed towers undergo an annual inspection of the guy wires for proper tension and to detect corrosion. Proper tensioning of guy wires ensures minimum deflection of antennas under extreme wind conditions. Repainting may be required for either type of tower. Repainting guyed towers is less labor intensive.

Forecasted stock of major tower components, such as the 3ST and KST bracing members shown here, is maintained at Andrew's Fayetteville facility.

Guyed Towers

Andrew guyed towers are suitable for applications from light-duty microwave and cellular radio to applications requiring extremely heavy loads.

The guyed tower is the most economical support system available and will, in most cases, provide lower steel, foundation and erection costs. Andrew can computer-design a guyed tower to meet specific requirements utilizing our four standard tower designs, having face widths of 24, 46, 54 and 64 inches (610, 1170, 1370 and 1625 mm).

Standard Features

The component features found in each of our four guyed towers provide inherent benefits which result in the quality you expect from Andrew.

Optimum Design. The Andrew computer analysis program ensures maximum tower stiffness, minimum twist and sway and minimum bending moment. All Andrew towers are designed in accordance with the latest EIA Standard RS-222 and local codes where applicable.

High Strength Plate Legs. Andrew formed steel plate legs allow for more accurate punching of the member than hot rolled angle legs. Angle legs rolled at the mill typically bow. The formed steel plate leg is made of 50,000 lb/in^2 (345 MPa) yield strength steel plate.

Stress-Free Foundation. An articulated base eliminates stress from uneven foundation settlement or wind-induced tower translation ensuring perfect, stress-free tower alignment. Anchor bolts are not necessary. A fixed base is available for special applications.

Reduced Guy Vibration. Flexible anchor shafts have a dampening effect on wind-induced guy vibrations. The shafts are galvanized and coated below grade with bitumastic paint to resist corrosion.

Integrated Waveguide Support. Prepunched waveguide support channels are a built-in feature of our guyed tower bracing systems. No clamps or angle adaptors are required for waveguide attachment.

Heavy-Duty Cable and Hardware. All guy cable on Andrew towers is either Extra-High Strength or Bridgstrand. Forged steel turnbuckles provide for future tensioning. Preformed dead-end type grips are standard. Fist grips are available upon request.

Rigidity. Tower column stiffness is controlled through the design and selection of various leg and diagonal sizes. Guy wires are attached at levels located to minimize bending moments. Torque stabilizers are utilized to resist twisting induced by large eccentric forces.

The Guyed Tower Series

Type R24. This 24 in (610 mm) face width tower is ideal for use in cellular radio fixed station applications and can meet the requirements of microwave systems supporting up to four 8 ft (2.4 m) diameter shielded antennas.

Bending moments caused by bolt connection eccentricities are eliminated with the use of single angle diagonal members in X-braced sections. These bracing components contribute greatly to the rigidity of the tower column. For additional information on the R24 tower, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1337.

Type M46. The M46 can support as many as six 10-foot (3 m) diameter antennas, but remains efficient in light duty applications as well. Its 46 in (1170 mm) face width allows the M46 to fulfill the requirements of most microwave systems.

Sections with heavy shear loads, such as those caused by antennas, are X-braced for greater rigidity using angle bracing members. For additional information on the M46 tower, request Bulletin 1331.

Type M54. The 54 in (1370 mm) face width tower is intended for microwave applications using more or larger antennas or where there are more stringent wind and ice loading conditions than those commonly encountered.

The M54 is X-braced in 4 ft (1.2 m) bays throughout to provide an extremely strong and rigid mast. Formed diagonal bracing along with back-to-back X-bracing in high shear areas are used in the bracing system. For additional information on the M54 tower, request Bulletin 1332.

Type M64. The 64 in (1625 mm) face width tower meets extremely heavy loading requirements associated with many horn or parabolic antennas, extreme wind, unusually heavy icing conditions or a combination of all three.

The face width along with a wide range of leg member sizes allows for long spans between guy levels without sacrificing tower rigidity. The Z-bracing pattern of back-to-back angles more efficiently resists heavy ice coatings and wind. For additional information on the M64 tower, request Bulletin 1333.

R24—The R24 is ideal for cellular applications, and is capable of supporting loads required for low-density microwave systems. Tower shown includes built-in seven-hole feeder support ladder and cellular platform.

Formed diagonal bracing contributes greatly to tower column rigidity and eliminates bending moments caused by bolt connection eccentricity. These bracing members are used on the popular R24, M46 and M54 guyed tower models.

M46 – The M46 meets the loading requirements of most fully-loaded microwave systems, including waveguides for six UHX® antennas, 10 ft in diameter, shown here, The built-in waveguide ladder requires only simple hardware to attach up to 12 feeders.

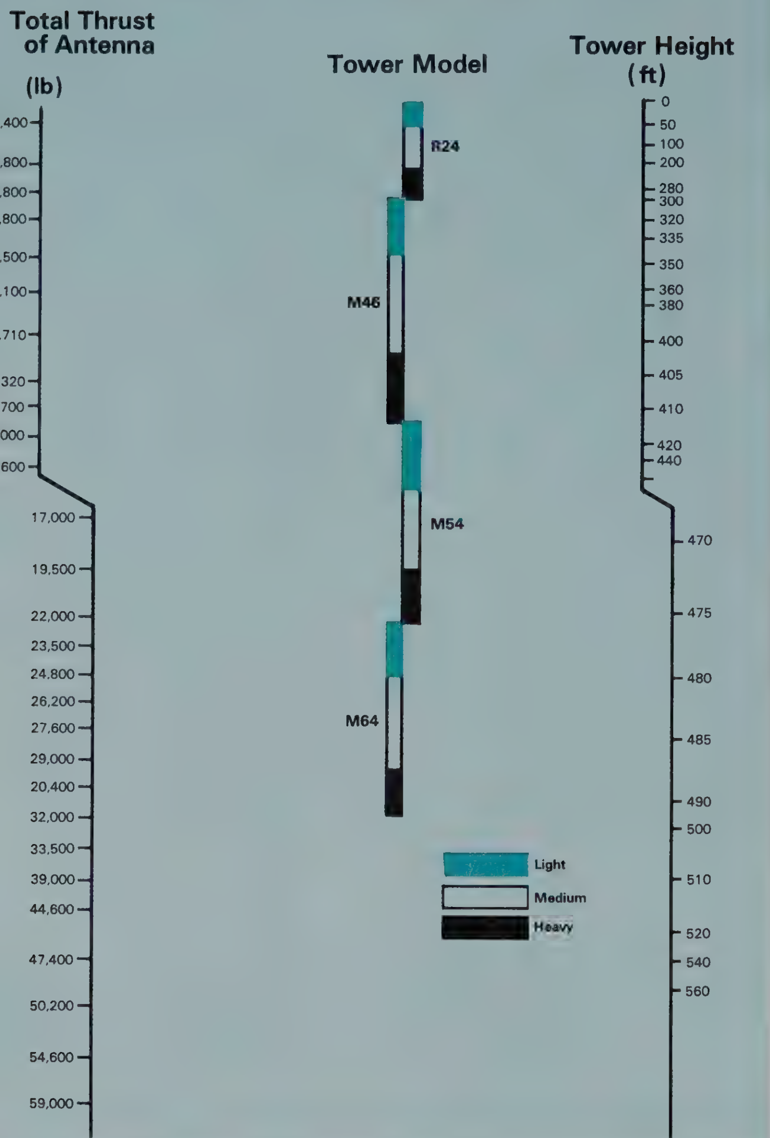
M54 – Each section of the M54 tower is X-braced providing superior rigidity. The M54 is a very effective support structure for up to nine UHX antennas 12 ft in diameter plus corresponding HELIAX® elliptical waveguide feeders.

M64 – Initial loading of the six UHX10-59 antennas shown can easily be accommodated on the M64. Up to 12 UHX antennas, 12 ft in diameter, or six SHX® horn antennas can be supported together with the required elliptical or circular waveguide. The neat and orderly routing of the EWP52 waveguide shown and all future runs is assured by the integral waveguide support system.

Guyed Tower	Typical Applications	Face Width in (mm)	Maximum Antenna Size	Maximum Tower Height ft (m)	Tower Height ft (m) at	Maximum Antenna Configuration
R24*	Cellular Light Microwave CATV LPTV	24 (610)	8 ft dia. with radome	350 (107)	288 (88)	4, 8-ft diameter parabolic antennas with radomes
M46*	Cellular Light/Medium Microwave CATV LPTV	46 (1170)	10 ft dia.	480 (146)	400 (122)	6, 10-ft diameter parabolic antennas
M54	Medium/Heavy Microwave Light Broadcast	54 (1370)	12 ft dia.	560 (171)	500 (152)	9, 12-ft diameter parabolic antennas or 4, 10-ft diameter horn antennas
M64	Heavy Microwave Medium Broadcast	64 (1625)	15 ft dia.	700 (213)	600 (183)	6, 10-ft diameter horn antennas or 12, 12-ft diameter parabolic antennas

*No horn antenna applications

Guyed Tower Selection Antenna Thrust Nomograph

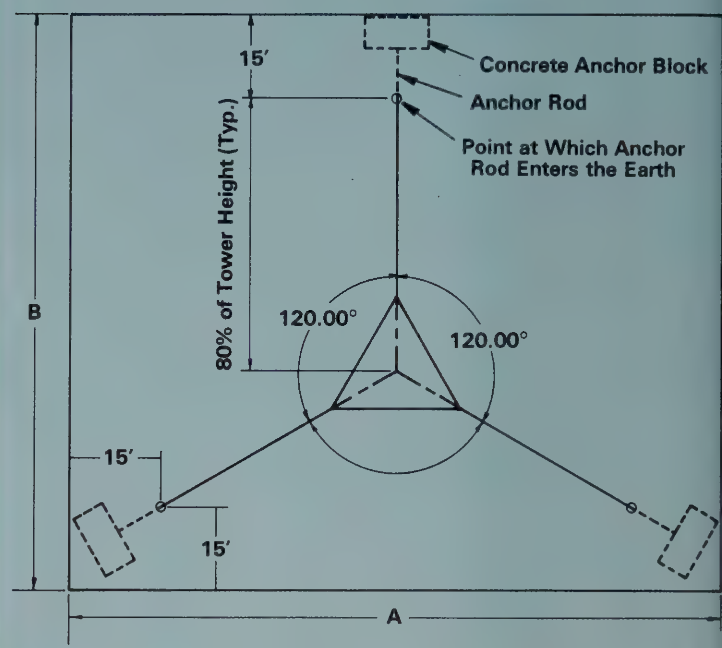


Step 1. Use the Antenna Thrust Load table on page 300 to determine each antenna's thrust at the required wind and ice loading.

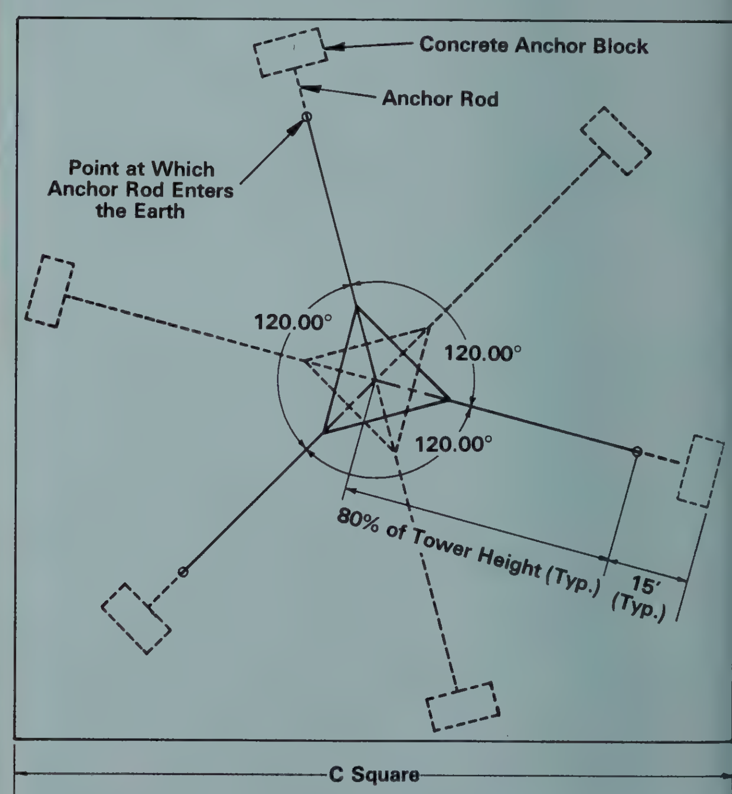
Step 2. Sum the thrusts of each antenna at all elevations.

Step 3. Using a straight edge, connect the applicable tower height with the indicated antenna thrust load. The intersection of that line corresponding to the tower model will indicate the tower needed to fulfill the requirements of that application.

Guyed Tower Land Requirements



Layout 1
Minimum area of land required. This area will not always permit orienting tower in the best position for antenna path direction.



Layout 2
The minimum area of land required to permit orienting the tower in any position for optimizing antenna path direction.

Guyed Tower Land Requirements at 80% Guying*

Tower Height	Layout 1			Layout 2	
	Acres	A	B	Acres	C
120′	.80	200′	175′	1.16	225′
130′	.94	215′	190′	1.32	240′
140′	1.04	225′	200′	1.49	255′
150′	1.16	240′	210′	1.67	270′
160′	1.32	255′	225′	1.93	290′
170′	1.46	270′	235′	2.14	305′
180′	1.64	285′	250′	2.35	320′
190′	1.76	295′	260′	2.58	335′
200′	1.92	310′	270′	2.81	350′
210′	2.13	325′	285′	3.14	370′
220′	2.31	340′	295′	3.40	385′
230′	2.50	350′	310′	3.67	400′
240′	2.68	365′	320′	3.95	415′
250′	2.88	380′	330′	4.24	430′
260′	3.13	395′	345′	4.65	450′
270′	3.34	410′	355′	4.96	465′
280′	3.57	420′	370′	5.29	480′
290′	3.80	435′	380′	5.63	495′
300′	4.03	450′	390′	5.97	510′
310′	4.33	465′	405′	6.45	530′
320′	4.53	475′	415′	6.82	545′
330′	4.84	490′	430′	7.20	560′
340′	5.10	505′	440′	7.59	575′
350′	5.37	520′	450′	8.00	590′
360′	5.71	535′	465′	8.54	610′
370′	5.94	545′	475′	8.97	625′
380′	6.30	560′	490′	9.40	640′
390′	6.60	575′	500′	9.85	655′
400′	6.91	590′	510′	10.31	670′
410′	7.23	600′	525′	10.93	690′
420′	7.55	615′	535′	11.41	705′
430′	7.96	630′	550′	11.90	720′
440′	8.29	645′	560′	12.40	735′
450′	8.64	660′	570′	12.91	750′
460′	9.00	670′	585′	13.61	770′
470′	9.36	685′	595′	14.15	785′
480′	9.80	700′	610′	14.69	800′
490′	10.18	715′	620′	15.25	815′
500′	10.49	725′	630′	15.81	830′

*The distance between the tower and outer guy anchor equals 80% of the tower height. Other ratios to 60% can usually be accommodated.

General Notes:

1. Space allowance has been made for concrete anchors as shown on layouts.
2. Information in table is based on outer anchors being located 80% of tower height from base and oriented 120° apart.
3. All information is based on level ground site conditions.
4. Height of tower = H (ft)
   A = [(H x 0.80) COS 30°] x 2 + 30'
   B = [(H x 0.80) x (1 + SIN 30°)] + 30'
   C = [(H x 0.80) + 15'] x 2

Plate leg members and high strength bolts ensure structural rigidity.

Self-Supporting Towers

Andrew offers a complete range of custom-designed triangular and square self-supporting towers, and the LST Series pre-engineered self-supporting tower. Many leg and diagonal sizes are available for each tower section making the Andrew self-supporting tower very versatile and economical.

A triangular tower is usually preferred since it has fewer members than square towers and is lighter and more economical to erect, and requires a less expensive foundation. Square towers provide additional face surface for antenna mounting and are suitable for special applications such as roof-top installations.

Standard Features

Optimum Design. Andrew's computer analysis program considers antenna loads and effects on member stresses and displacements. The displacement of the actual tower is determined for every joint, and then used to calculate tower twist and sway. All Andrew towers are designed in accordance with the latest EIA Standard RS-222 and local codes where applicable.

High Strength Plate Legs. Formed steel plate legs made of 50,000 lb/in^2 (345 MPa) yield strength steel plate allow for more accurate punching of the member than hot rolled angle legs and proper, cost-effective tower erection.

High Strength Angle Bracing. Tower legs are braced along both planes to ensure rigidity. Further internal bracing provides required torsional stability and rigidity. Secondary horizontal and diagonal members are provided where required to adequately support the main members.

High Strength Leg Splices. High strength 3/4 inch or larger bolts are used in all leg splices.

Foundation Designs. Andrew designs the foundation at no additional cost. The standard foundation consists of isolated spread footings and piers. Andrew is also fully prepared to design non-conventional foundations or attachments for roof mounted towers.

GRASIS® Self-Supporting Towers

Triangular Self-Supporting Tower Series

Three main leg members form an equilateral triangular cross-section of each custom-designed triangular tower. Combined with an extensive internal bracing system, this design provides each tower with exceptional torsional stability and rigidity.

3ST Self-Supporting Tower. The 3ST is ideal for most standard microwave applications, especially those where a narrow base width is required. The 3ST is well suited for combining cellular and microwave applications on a single tower.

Its steep 21-in taper per every 20 ft (533 mm per 6 m) makes the tower the choice for restricted property applications. It efficiently meets loading requirements for heavy common carrier loads. It is most efficient in applications of four UHX 10-foot (3 m) diameter antennas, but can comfortably carry as many as 10, 10-foot (3 m) diameter UHX antennas up to a height of 500 ft (152 m). For more information on the 3ST tower, contact your local Andrew Sales Office listed on the inside back cover and request Bulletin 1377.

KST Self-Supporting Tower. The KST is suitable for most heavy microwave applications especially those using multiple high performance antennas or a combination of high performance antennas and horn antennas.

The 36-in taper every 20 ft (915 mm per 6 m) provides maximum rigidity and strength. It efficiently meets loading requirements for heavy common carrier loads. It is most efficient in applications requiring from four UHX 10-foot (3 m) diameter antennas up to nine 10-foot (3 m) diameter UHX, or six pipe mounted horn antennas. The KST can easily carry the maximum load up to a height of 300 ft (91 m). For more information on the KST tower, request Bulletin 1376.

KST – This 255 ft KST is supporting six UHX antennas. The corresponding HELIAX® EWP52 elliptical waveguide feeders are all neatly routed to a pair of Andrew PLASTIDOME equipment shelters. This microwave repeater station illustrates Andrew's turnkey system capabilities. All site construction, including foundations, fencing and access roads, were engineered and installed by Andrew.

Square Self-Supporting Tower Series

Square towers provide additional mounting surface for antennas and may be used for special site conditions. Each Andrew four-sided tower has angular 50 ksi legs. All main bracing is in a back-to-back configuration to eliminate eccentricity.

4SHT Self-Supporting Tower. The 4SHT four-sided self-supporting tower from Andrew is designed for extremely heavy antenna loads and provides maximum mounting surface area.

The tower can carry 15 horn antennas with work platforms and five 10-foot (3 m) diameter UHX antennas to a height of 450 ft (137 m). Its taper is 3 ft per 25 ft (1 m per 7.62 m).

The face width of the 4SHT permits mounting two horn reflector antennas side by side on one face at the tower top. Platforms for mounting SHX horn antennas are an inherent part of the 4SHT design.

4ST Self-Supporting Tower. The 4ST (not shown) is suitable for applications requiring up to 15, 10-foot (3 m) diameter UHX antennas.

Its taper of 19 in per 20 ft (483 mm per 6 m) makes it ideal for special site conditions where property limitations exist.

Self-Supporting Tower Base Widths

Section	3ST	KST	4ST	4SHT
	Base Width ft (m)			
1	3.75 (1.20)	6.50 (1.98)	4.75 (1.45)	8.58 (2.62)
2	5.25 (1.60)	9.25 (2.82)	6.33 (1.93)	11.58 (3.53)
3	7.00 (2.13)	12.00 (3.65)	7.92 (2.41)	14.58 (4.44)
4	8.75 (2.59)	15.00 (4.57)	11.08 (3.38)	17.54 (5.35)
5	10.50 (3.20)	18.00 (5.48)	12.67 (3.86)	20.50 (6.25)
6	12.25 (3.73)	20.75 (6.32)	14.25 (4.34)	23.50 (7.16)
7	14.00 (4.26)	23.75 (7.24)	15.83 (4.82)	26.46 (8.06)
8	15.75 (4.80)	26.75 (8.15)	17.42 (5.31)	29.46 (8.99)
9	17.50 (5.33)	29.75 (9.06)	19.00 (5.79)	32.46 (9.89)
10	19.25 (5.86)	32.75 (9.98)	20.58 (6.27)	35.46 (10.8)
11	21.00 (6.40)	35.75 (10.8)	22.17 (6.76)	38.46 (11.7)
12	22.75 (6.93)	38.75 (11.8)	23.75 (7.24)	41.46 (12.6)
13	24.50 (7.47)	41.75 (12.7)	25.33 (7.72)	44.46 (13.5)
14	26.25 (8.00)	47.75 (14.5)	26.92 (8.20)	47.46 (14.5)
15	28.00 (8.53)	46.33 (14.1)	28.50 (8.67)	50.46 (15.4)
16	29.75 (9.07)	—	—	54.96 (16.7)
17	31.50 (9.60)	—	—	59.46 (18.1)
18	33.25 (10.1)	—	—	—
19	35.00 (10.6)	—	—	—
20	36.75 (11.2)	—	—	—
21	38.50 (11.7)	—	—	—
22	42.00 (12.8)	—	—	—
23	45.50 (13.9)	—	—	—

3ST – The 3ST is ideal for standard microwave systems and is also efficient for cellular and broadcast applications. Climbing ladders and waveguide ladders ensure quick, efficient antenna system installation. Antennas shown with optional paint and radome to match tower color band.

4SHT – The 4SHT, Andrew's heaviest self-supporting tower, is designed for very heavy loads and provides maximum mounting surface area for both horn and parabolic antennas. Pipes, beams or (as shown here) platform mounts for the horn antennas can be provided.

Self-Supporting Tower Selection

Tower	Typical Applications	Tower Section Height ft (m) Section	Tower Section Height ft (m) Height	Maximum Tower Height ft (m)	Tower Height ft (m)	at	Maximum Antenna Configuration
3ST	Light/Medium Microwave Heavy Cellular Radio Light Broadcast	1-21 22,23	20 (6.1) 40 (12.2)	540 (165)	500 (152)		10, 10-ft diameter parabolic antennas
KST	Medium/Heavy Microwave	1-13 14,15	20 (6.1) 40 (12.2)	360 (110)	300 (91)		9, 10-ft diameter parabolic antennas or 6 pipe mounted horn antennas
4ST	Heavy Microwave	1-15	20 (6.1)	300 (90)	300 (91)		15, 10-ft diameter parabolic antennas
4SHT	Heavy Microwave	1, 3-13 2 14, 15	25 (7.6) 22 (6.7) 37.5 (11.4)	475 (145)	450 (137)		15, 10-ft diameter horn antennas and 5, 10-ft diameter parabolic antennas

LST Series Self-Supporting Tower

The Andrew LST self-supporting tower is an economical, lightweight triangular tower ideal for cellular radio, light-duty microwave, CATV and LPTV applications.

The tower is designed to support a cellular radio antenna platform and up to two 8 ft (2.4 m) diameter standard microwave antennas or various combinations of microwave, mobile or LPTV antennas.

The LST tower is pre-engineered to minimize installation time and pre-packaged for prompt delivery. Four basic tower configurations are available for different loading requirements. Use the following tables to select the model and type number for your application.

Standard Features

Reduced Wind Resistance. The LST utilizes high strength tubular legs for low wind resistance. Flanged leg splices simplify erection. All splices utilize A-325 bolts.

High Strength Bracing. The bracing pattern of the LST consists of angular members in an X pattern for high strength and torsional rigidity. One bolt bracing connections reduce installation time.

Step-Bolt Climbing Devices. LST towers include step bolts that run the full length of one leg for climbing purposes.

Simplified Equipment Connections. Transmission line support ladders or formed transmission line support plates designed for the LST will accommodate Andrew's new Snap-In Hanger for coaxial cable. When used with Andrew transmission line support ladders or adaptors, the Snap-In Hanger requires no bolted connections. Antenna mounts and ice shields are clamped on the LST tower providing flexibility in mounting location and eliminating the need for drilling or punching. For more information regarding the Snap-In Hanger and other transmission line accessories, refer to pages 252-256.

LST Antenna Thrust Loads

Tower Loading	Wind (lb/ft^2) + Ice (Radial in) 30+0″	30+½″	40+0″	40+½″
LST1-( )				
Maximum Thrust due to Antennas (lb)	5992	5160	5160	4418
LST2-( )				
Maximum Thrust due to Antennas (lb)	6610	5730	5730	4861
LST3-( )				
Maximum Thrust due to Antennas (lb)	553	410	410	348
LST4-( )				
Maximum Thrust due to Antennas (lb)	473	205	205	175

LST Tower Selection

LST Series Self-Supporting Tower. Obtain the thrust value associated with your application from the Antenna Thrust Load table on page 300. Sum all the thrust values of the antennas for the total thrust value to be applied to the tower. The chart at left indicates the maximum thrust of antennas for each LST Series tower at various loading and icing conditions. A tower should be selected which has a maximum thrust value equal to or slightly greater than the total obtained.

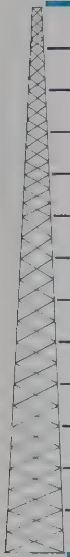
LST – The LST Series tower shown incorporates retracting mount brackets for the cellular antennas to provide easy access for maintenance or replacement. The climbing ladder, waveguide support ladder and microwave antenna mount all clamp on ensuring quick, error-free installation.

LST( ) Self-Supporting Tower Series

Typical Applications
LST1 – Light Microwave, Cellular
LST2 – Light Microwave, Radio, By-Pass
LST3 – Light Cellular, CATV, LPTV, By-Pass
LST4 – Paging, Two-Way, CATV, LPTV

Ordering Information

LST1-( ) Self-Supporting Tower



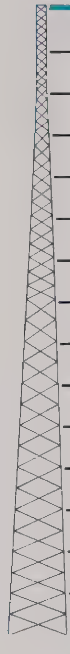
Section Type Number	Tower Height feet	Base Spread feet	Section‡ Steel Weight lb	Foundation* † Cu. yd.
1	20	5.83	655.7	5.6
2	40	7.67	1099.8	7.3
3	60	9.50	1442.3	9.4
4	80	11.33	1888.5	10.3
5	100	13.17	2125.9	11.4
6	120	15.00	2674.1	11.5
7	140	16.83	3661.9	11.6
8	160	18.67	3991.6	11.9
9	180	20.50	4340.9	14.3
10	200	22.33	6241.7	17.2
11	220	24.17	6787.0	19.9
12	240	26.00	7114.0	22.8
13	260	27.83	7877.4	23.9

LST3-( ) Self-Supporting Tower

Section Type Number	Tower Height feet	Base Spread feet	Section‡ Steel Weight lb	Foundation† Cu. yd.
1D	20	4.00	571.1	8.3**
1C	40	4.00	571.1	8.3**
1B	60	4.00	658.8	8.9**
1A	80	4.00	931.0	12.7**
1	100	5.83	911.0	16.3**
2	120	7.67	1052.0	21.3**
3	140	9.50	1186.0	10.8*
4	160	11.33	1302.0	11.6*
5	180	13.17	1679.0	12.4*
6	200	15.00	1915.0	14.4*
7	220	16.83	2395.0	15.4*
8	240	18.67	2864.0	16.5*
9	260	20.50	3058.0	18.9*
10	280	22.33	3444.0	20.1*
11	300	24.17	4202.0	20.6*
12	320	26.00	5337.0	21.1*
13	340	27.83	6513.0	21.6*

*Spread footing used.
**Mat footing used.
† Typical foundation only. Local codes and specifications may affect foundation fabrication.
‡ Add the individual tower section weights to obtain the total tower weight for the LST Series tower you have selected.

LST2-( ) Self-Supporting Tower



Section Type Number	Tower Height feet	Base Spread feet	Section‡ Steel Weight lb	Foundation* † Cu. yd.
1B	20	4.00	990.0	8.5
1A	40	4.00	1460.0	10.1
1	60	5.83	1490.0	11.4
2	80	7.67	1770.0	11.5
3	100	9.50	1860.0	12.0
4	120	11.33	2270.0	12.8
5	140	13.17	2590.0	13.5
6	160	15.83	3470.0	14.1
7	180	16.83	3650.0	14.8
8	200	18.67	3800.0	15.8
9	220	20.50	4220.0	16.4
10	240	22.33	5330.0	19.3
11	260	24.17	6720.0	21.4
12	280	26.00	6970.0	22.8
13	300	27.83	7350.0	25.1

LST4-( ) Self-Supporting Tower

Section Type Number	Tower Height feet	Base Spread feet	Section‡ Steel Weight lb	Foundation† Cu. yd.
1F	20	2.25	305.1	7.2*
1E	40	2.50	480.1	7.5*
1D	60	2.75	579.8	7.7*
1C	80	3.00	680.0	8.1*
1B	100	3.50	890.0	8.3*
1A	120	4.00	930.0	12.7*
1	140	5.83	900.0	16.3*
2	160	7.67	850.0	21.3*
3	180	9.50	1170.0	8.6
4	200	11.33	1280.0	9.3
5	220	13.17	1680.0	9.9
6	240	15.00	1880.0	11.5
7	260	16.83	2380.0	12.3
8	280	18.67	2680.0	13.2
9	300	20.50	2860.0	15.1

Ordering Information for LST Tower

Example Type No. LST(1)-(7)-(12)

LST1-7-12 is the type number used to order a LST1 Series tower starting with section 7 and ending with section 12.

All tower appurtenances fully complement the particular antenna system required for your application.

Expandable cellular antenna platforms can provide antenna spacing up to 18 ft (5.5 m).

Cellular Antenna Platforms

A platform for mounting up to 12 omnidirectional or 12 directional cellular antennas is available as an option. This platform provides a safe working environment for antenna installation and adjustment.

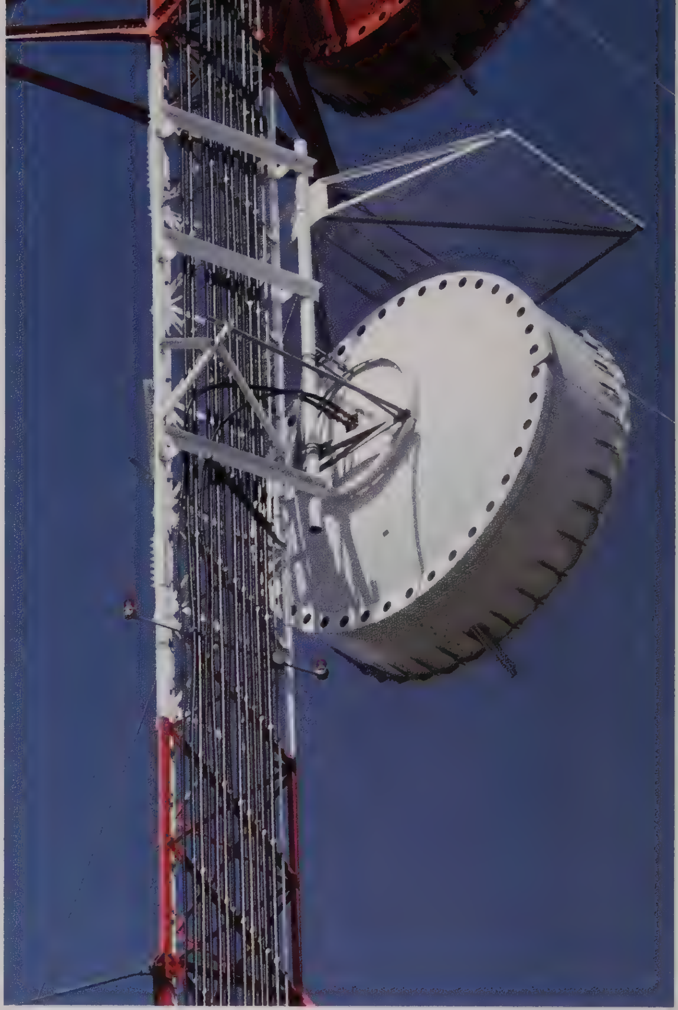
Normal antenna spacing is 11.5 ft (3.5 m). Spacing can be increased to a maximum of 18 ft (5.5 m) by using optional retractable arms. The platform is designed to be preassembled on the ground and hoisted into position thus simplifying installation.

Cellular Antenna Platform for use with tower types:	Order Type No.
R24 or monopole	**348213**
LST, 3ST or M46	**348214**

Antenna Supports

A 4-1/2 in (114 mm) mounting pipe and sidestrut support angles are available to support each microwave antenna. Supports are designed to ensure antenna rigidity and pointing stability with sidestruts positioned as required by the manufacturer.

Horn-reflector antenna supports are available for the platform, pipe and beam mount configurations. GRASIS platform supports on guyed towers incorporate the antenna support with torque stabilizers to ensure rigidity.



Antenna mounts are selected for each type of antenna and are designed to transmit loads into the tower members with maximum rigidity. Ice shields protect antennas at lower elevations. The waveguide support system shown is a built-in feature of all Andrew guyed towers.

All parabolic antenna mounts include pipe a minimum of 10.5 ft (3.2 m) to allow all antenna mounts to be securely attached between pipe support members and to accommodate bottom struts if desired.

For pipe mounted horn antennas, schedule 80 pipe 16 ft (4.9 m) long ensures adequate working space for antenna and waveguide support auxiliary platform attachment. Supports can also be provided for other applications. A full line of support hardware for mounting UHF, VHF, CATV and Broadcast antennas can be supplied.

Order Type No.

Antenna Support Mount TACS(M)-(L)-(S or D)

M = Tower Model (e.g., 3ST)
L = Pipe Length (10.5 ft standard)
S = Single Antenna
D = Two antennas at one elevation on same face

VHF Antenna Sidemount/Top Mount TACV-(M)

M = Tower Model (e.g., M46)

Climbing Devices

Safety cable or rigid rail-type safety climbing devices are available as an option. Step bolts mounted to a tower leg can also be provided.

Order Type No. TACC-(H)-(C or R)

H = Tower Height ft, plus 25 ft (7.5 m)
C or R = Cable or Rail

Climbing devices are provided with all towers. Safety cable or rigid rail-type devices are available as an option.

Tower supported, pipe supported or free-standing bridges are available for routing transmission line from the tower to the equipment shelter.

Waveguide Support Systems

Waveguide support systems are built into all Andrew guyed towers. A variety of transmission line supports are available for Andrew self-supporting towers. Supports bolt directly to the tower bracing for mounting waveguide or coaxial cable hangers without angle adaptors or special brackets. Support ladders can be provided for applications where 2, 6, 12 or more runs are required. For more information on waveguide accessories, refer to page 190-194 .

Order Type No. TACW-(M)-(H)-(No. of Runs)

M = Tower Model (e.g., KST)
H = Tower Height ft
No. of Runs = Number of transmission line runs (13 max. on one ladder.)

Waveguide Bridges

Some typical waveguide bridge arrangements are illustrated on pages 10-21 in the Microwave System Planning section. Waveguide bridges are available for all towers in standard widths of 16, 32 or 48 in (406, 812 or 1219 mm). An awning at the tower end is provided when required to allow for smooth transition of the HELIAX® feeders.

Transmission line support systems for self-supporting towers are available for 2, 6, 12 or more runs of waveguide, and are prepunched with 3/4 in (19.05 mm) and 7/16 in (11.11 mm) holes to accommodate Andrew Snap-In Hangers and standard hangers.

Bridges approximately 10 ft (3 m) long can be supported at the tower or at both the tower and the shelter, whichever is most suitable.

For long spans, free-standing bridges using pipe support posts are available. Sixteen and 32 in versions require post/cantilever assemblies. Straddle posts are used for 48 in wide bridges. Normal spacing between posts is 10 feet.

Transmission line supports are also available to provide optimum hanger spacing and orderly routing beneath the bridge. Galvanized steel angles are prepunched for 3/8 in (9.525 mm) hanger mounting hardware on 4 in (102 mm) centers. Angle ends are prepunched for use with 31771 threaded rod kits described on page 191. Large galvanized washers are provided allowing for suspension of angle support directly from bridge mesh without field drilling.

Order Type No.

Waveguide Bridge TACB(L)-(W)

L = Length ft
W = Width (16, 32 or 48 in)

Bridge Post Kit TACBP-(C or S)

C = Cantilever (width to 32 in) includes one post
S = Straddle (bridge widths greater than 32 in) includes two posts.
Specify quantity required

Waveguide Bridge Transmission Line Support:

Bridge Width	Order Type No.
16 in (406 mm)	**207123-1**
32 in (812 mm)	**207123-2**
48 in (1219 mm)	**207123-3**

Specify quantity required

Factory applied epoxy paint with a life expectancy of up to 15 years is available as an option. Even further durability can be provided by a factory-applied polyurethane top coat.

Paint

Factory-applied hi-build polyamide epoxy paint, with a life expectancy of up to 15 years, is provided as an option. A polyurethane top coat can be added for greater durability.

Towers are also available unpainted. Two-coat latex paint is available for field applications.

Order Type No. TACP(M)-(H)-(E, P or L)

M = Tower Model (e.g., 4ST)
H = Tower Height ft
E = Epoxy
P = Epoxy with Polyurethane top coat
L = Latex

ANCO Locknuts

These fasteners have a positive locking device and cannot vibrate loose. They are available as an option to standard nuts and lock washers.

Order Type No. TACN(M)-(H)

M = Tower Model (e.g., R24)
H = Tower Height ft

Grounding Systems

Grounding systems meeting EIA specifications include #6 AWG solid copper wire, 8 ft (2.4 m) grounding rod and clamps, and hardware. Special grounding systems meeting customer specifications are also available.

Order Type No. TACG(M)-(EIA or SPL)

M = Tower Type (guyed or self-supporting)
EIA = Standard EIA grounding
SPL = Special grounding (specify requirements)

Lightning Rod

Order Type No. TACL-(L)-(D)

L = Length (4 ft or 6 ft)
D = Diameter (.625 in or .750 in)

Tower Analysis

Existing Andrew towers can be analyzed and our tower engineers will recommend the changes necessary for expanded applications.

Work/rest platforms can be supplied according to specifications.

Order Type No. TACA-(M)-(H)

M = Tower Model (e.g., M54)
H = Tower Height ft

Work/Rest Platforms

Platforms are available as specified. Handrails, extended gratings and kick plates are provided according to supplied specifications.

Ice Shields

Ice shields offered in 8, 10 and 12 ft (2.4, 3.0 and 3.7 m) models are available for parabolic antennas. Ice shields for horn-reflector antennas are also available. For more information, refer to page 90.

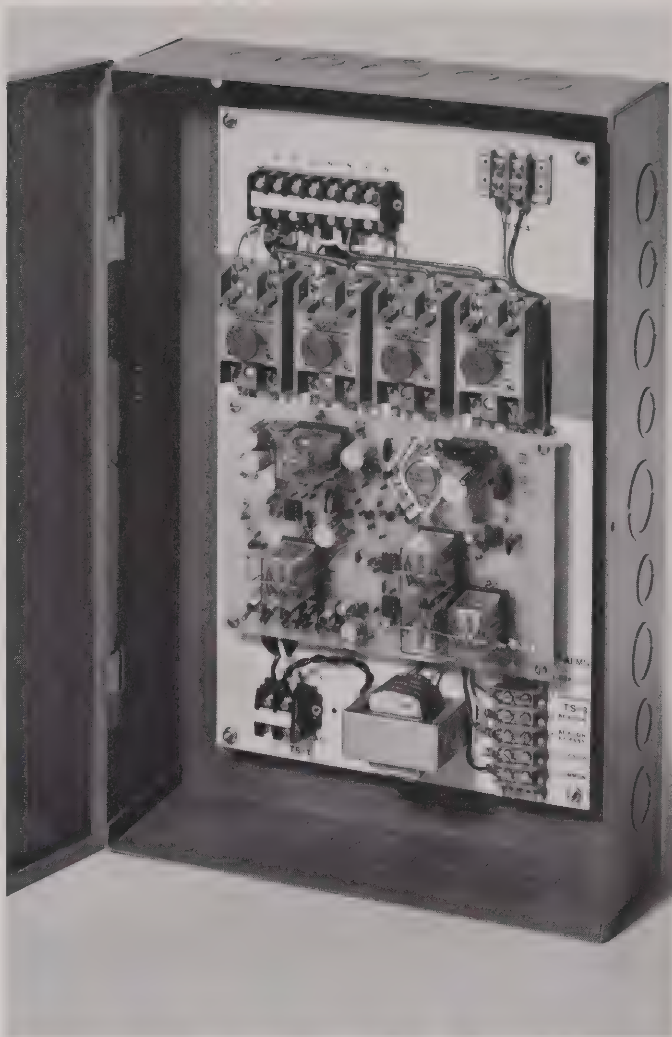
On new installations, the ice shield attaches to an extended antenna support pipe. On existing installations, Andrew provides an extension support pipe and tiebacks to interface with the existing antenna support.

Order Type No. TACI(T)-(D)

T = Antenna Type (e.g., grid, horn, shielded, unshielded)
D = Diameter of antenna

Lighting Systems

Tower lighting systems are described on page 299.



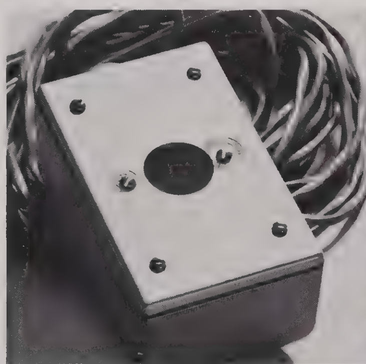
GLC Tower Light Controller

The Andrew GLC Light Controller features increased reliability through its solid-state design which provides voltage spike protection, zero voltage switching and "soft turn-on". This innovative design also prevents RFI, increases lamp life and has a high degree of transient protection. Andrew also offers beacons, sidelights and other lighting system components.

In most cases, replacing an older type light controller with a GLC only requires the substitution of the panel and photocell. The GLC automatically activates the alarm and turns on the lights to steady burning should a beacon failure occur. Power failure activates all alarms. When power is restored, all alarms and control circuits are automatically restored to function without cycling.

Voltage spike protection is provided by isolation of circuits from the AC power supply. The supplied photocell is protected from power surges by its own floating power supply.

The Andrew GLC also features visual indicators and test switches to allow testing of functions without the use of external equipment. All models allow for the addition of load balance resistors for use with emergency generator systems. The GLC meets FAA and FCC regulations for lighting on all types of towers.



GLC Polarized Photocell

Standard 300 mm Flashing Beacon

Ordering Information

Description	Tower Height ft (m)	Beacons	Type No.
GLC	21 – 150 (6.4 – 45)	0	349500-A1**
GLC for FAA A-1	151 – 350 (46 – 107)	1	349500-1B*
GLC for FAA A-1	151 – 350 (46 – 107)	1	349500-2BS*†
GLC for FAA A-2	351 – 700 (107 – 213)	2	349500-2B*
Load Balance Resistor	151 – 700 (46 – 213)	—	349529
Photocell (spare)	21 – 700 (6.4 – 213)	—	349501

Note: One photocell included with each GLC.
*Wired for load balance resistor.

**One set of two sidelights continuously lit.
†Separate alarms for each bulb in one beacon.

Antenna Thrust Load

Type Antenna	Antenna Size	Thrust at wind pressure (lb/ft²) + Radial ice (in) 30+0	30+½	40+0	40+½
Standard Antennas Solid Parabolic Dish	2 ft diameter	103	105	138	140
	4 ft diameter	473	491	630	655
	6 ft diameter	1040	1067	1386	1423
	8 ft diameter	1746	1782	2328	2376
	10 ft diameter	2701	2745	3601	3660
	12 ft diameter	4131	4186	5508	5581
	15 ft diameter	6126	6193	8169	8258
Standard Antennas with Radome	2 ft diameter	54	55	72	73
	4 ft diameter	247	257	330	342
	6 ft diameter	543	558	725	744
	8 ft diameter	913	932	1217	1242
	10 ft diameter	1412	1435	1883	1913
	12 ft diameter	2160	2188	2879	2917
	15 ft diameter	3203	3237	4270	4317
High Performance Antenna HP, HPX, UMX, UGX	2 ft diameter	94	101	125	134
	4 ft diameter	351	365	468	486
	6 ft diameter	790	811	1053	1081
	8 ft diameter	1363	1390	1818	1854
	10 ft diameter	2092	2126	2789	2835
	12 ft diameter	2977	3017	3969	4023
	15 ft diameter	4595	4654	6127	6193
2 GHz Grid Antennas	4 ft diameter	132	473	176	630
	6 ft diameter	307	1040	410	1326
	8 ft diameter	535	1746	713	2328
	10 ft diameter	838	2701	1117	3601
	12 ft diameter	1224	4131	1632	5508
900 MHz Grid Antenna	4 ft diameter	92	315	123	419
	6 ft diameter	215	728	287	928
	8 ft diameter	375	1222	500	1630
	10 ft diameter	587	1890	782	2520
Omnicellular Antennas	13 ft	60	82	80	109
with elements	8 ft	165	287	220	383
without elements	8 ft	56	213	75	284
Two-Way Antennas	9 ft	48	67	64	89
	10 ft	56	79	74	105
Retractable Cellular Antenna Mount Brackets		285	360	380	480
Cellular Platform with Retractable Mount Brackets		1388	1488	1850	1984

Antenna Thrust Load Reduction

The EIA code allows a reduction to be applied to the antenna thrust if more than one parabolic dish antenna is mounted at the same elevation. This is to take into account shadowing of one antenna by another. Make this reduction for your application in order to determine which tower best suits your application.

– For applications with two antennas at the same elevation, take 100% thrust for the largest antenna and 75% of the indicated thrust for the remaining antenna.

– For applications with three antennas at the same elevation, take 100% thrust for the largest antenna and 65% of the indicated thrust for the remaining two antennas.

Example: A tower has 2, 10 foot diameter standard parabolic dish antennas at one elevation. Using 40+1/2" loading, the total thrust for that elevation would be as follows:

3660 + .75 (3660) = 6405 lbs of thrust

Tower System Checklist

All Andrew guyed towers and self-supporting tower models are designed based on supplied specifications. The LST Series self-supporting tower offers four basic tower configurations for different loading requirements. The following checklist will aid in preparing an accurate tower quotation.

Tower Model

Guyed	Self-Supporting	
R24	3ST	LST1
M46	KST	LST2
M54	4SHT	LST3
M64	4ST	LST4

Tower Height ________ ft

Wind Loading

Structural Specifications

– Wind Pressure kPa ______ lb/ft² ______

or

– Wind Velocity km/h ______ mph ______

Rigidity Specifications

– Wind Pressure ±________ ° twist and sway at ________ lb/ft²

or

– Wind Velocity ±________ ° twist and sway at ________ mph

Radial Ice Loading ______ in ______ mm

Antenna Loading

Antenna Type(s)	______	______	______
Antenna Diameter	______	______	______
Quantity	______	______	______
Radome	______	______	______
Elevation	______	______	______
Azimuth	______	______	______
Future Antennas	______	______	______
Transmission Line	______	______	______
Twist/Sway Limits	______	______	______

Standard Andrew PLASTIDOME shelter with optional air conditioner, exterior light, and motorized louver with rainhood.

Standard Andrew concrete shelter with steel door and optional exterior light.

Andrew offers two lines of GRASIS equipment shelters for use in microwave, broadcast, cellular radio, military communications, telephone digital loop carrier systems and other system applications.

PLASTIDOME shelters from Andrew are the industry standard for prefabricated fiberglass equipment shelters. The innovative one-piece design and the strength of molded fiberglass-reinforced polyester (FRP) sandwich construction result in a maintenance-free structure that provides maximum protection to sensitive equipment.

Andrew concrete shelters combine the permanence of reinforced concrete with an aesthetically appealing appearance for the premier transportable shelter in the industry. Andrew concrete shelters are constructed of 4-inch (100 mm) panels of reinforced lightweight structural concrete providing the ultimate in bullet, vandal and fire resistance.

All Andrew shelters can be pre-equipped per customer specification with complete HVAC, electrical/mechanical and standby power systems. Andrew can also integrate customer supplied electronics and perform thorough pre-ship testing programs to help expedite critical in-service dates.

Andrew PLASTIDOME shelter, adjacent to a runway of Atlanta's Hartsfield International Airport, provides protective shelter for delicate instrument landing system (ILS) equipment.

Features and Advantages

- **Exceptional Structural Strength.** PLASTIDOME shelters are able to withstand high winds, high impacts and heavy loads because of the high strength-to-weight ratio of FRP and the added strength of the sandwich dome design.

- **Completely Weatherproof Surfaces.** The interior and exterior surfaces of the dome are protected with a seamless and unbroken finish of isophthalic polyester that is chemically bonded to the FRP shell. This produces a hard, smooth, pinhole-free surface that prevents moisture penetration, blocks out ultraviolet rays and resists corrosion.

- **One-Piece, Single-Joint Design.** The one piece dome has the door jamb molded in. The only construction joint in the entire structure is where the dome is bolted to the one-piece floor. This single joint is sealed with continuous neoprene gaskets and an ultraviolet-stable, permanently elastic sealer, eliminating the possibility of cracks or leaks.

- **Exceptional Insulation Properties.** The dome and door of the PLASTIDOME shelter are insulated with rigid, closed-cell urethane foam, the most efficient insulating material commercially available. The "U" factor for the shelter is approximately 0.073 BTU/ft^2/°F.

- **Maximum Protection in Severe Environments.** The structural strength of the PLASTIDOME shelter, the unsurpassed insulating properties of the dome's urethane core and the completely weatherproof isophthalic polyester surface combine to keep sensitive equipment in an optimum environment, even under the most severe conditions.

- **Low Maintenance.** Typical maintenance includes periodic inspection, cleaning and repair of scratches. Should field damage occur, PLASTIDOME shelters can be quickly, easily and permanently repaired.

- **Factory Installed Electrical Equipment.** PLASTIDOME shelters can be equipped with a wide selection of factory-installed electrical equipment to minimize on-site installation cost and time. A select line of shelters that are pre-equipped with commonly requested equipment is also available. Customer-supplied equipment may also be installed and arrangements can be made for customers to test their equipment at the factory.

- **Fast On-Site Installation.** Since PLASTIDOME shelters arrive at the site completely assembled and fully equipped, on-site installation time and cost are substantially less than that of built-in-place structures.

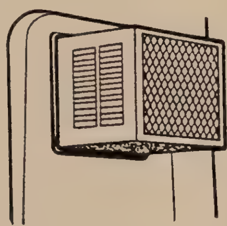
- **Easily Transported.** PLASTIDOME shelters are easier to transport because of their light weight. Even larger sizes, fully equipped, can be helicopter-lifted to building roofs and remote site locations.

- **Available Under General Services Administration (GSA) Contract.** Andrew PLASTIDOME shelters are available under GSA contract.

One-piece molded FRP dome consists of outside and inside seamless shells with a foamed-in-place urethane core.

Integral ribs are molded into outside and inside shells with continuous wood blocking laminated to the inside shell.

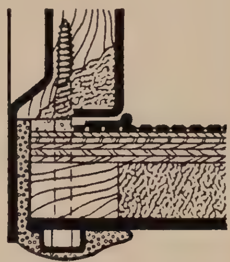
Plywood on back of inside shell provides for wall-mounted equipment.



Air conditioner case is secured to the dome, trimmed and weather sealed.

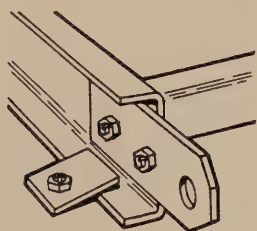
Door frame is molded into exterior shell. Door construction consists of two molded FRP skins and a urethane core. Continuous neoprene gasket seals hatch-type door.

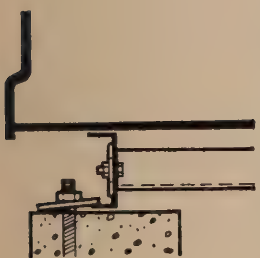
Continuous neoprene gaskets seal the floor joint. The space between the floor and the dome skirt is filled with a permanently elastic sealer. The dome is bolted to floor at each rib.



Sandwich panel floor consists of a vinyl-covered plywood upper face, expanded polystyrene foam core, and a galvanized sheet metal lower face.

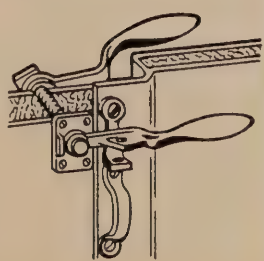
Removable galvanized steel lifting lugs at four corners.





Hot-dip galvanized steel channel skid assembly bolts to the floor and is secured to the foundation with anchor bolts and plates.

Chrome-plated solid brass door levers with inside releases and tamper-proof stainless steel hinges. Door includes inside and outside door handles and a doorstop with holder.



Construction

Each PLASTIDOME shelter consists of the following:

One-Piece Sandwich Panel Dome. The one-piece dome consists of two molded FRP shells with a rigid, closed cell urethane foam core. The sandwich design adds structural strength and the closed cell foam core provides exceptional insulation while preventing absorption of moisture. Wooden ribs behind the inside shell allow for equipment attachment. Door jambs are molded in, so there are no joints to crack or leak. Exterior and interior surfaces are protected with an unbroken finish of isophthalic polyester that is chemically bonded to the FRP shell. This produces a hard, smooth, pinhole-free surface that prevents moisture penetration, blocks out ultraviolet rays, resists corrosion and never needs painting.

One-Piece Sandwich Panel Door. The door on each PLASTIDOME shelter is a one piece sandwich panel consisting of two molded FRP shells with a 1.75 in (44 mm) urethane foam core. Continuous neoprene gaskets form an airtight seal between the door and the jamb. The tamper-proof hinges are stainless steel, while the handles and wedge-type door levers are made of chrome plated solid brass and have inside releases. Optional steel doors are also available.

One-Piece Sandwich Panel Floor. The floor of each PLASTIDOME shelter is a one-piece sandwich panel with an upper surface of vinyl tiled 1-1/8 in (28 mm) plywood and a lower surface of galvanized sheet metal. The plywood surface allows attachment of equipment anywhere on the floor. The galvanized sheet metal surface is corrosion, fire and rodent resistant. The core is filled with 1.5 in (37 mm) of expanded polystyrene foam. Continuous neoprene gaskets seal the construction joint where the dome is bolted to the floor. The floor is then bolted to a galvanized steel skid.

Ordering Information

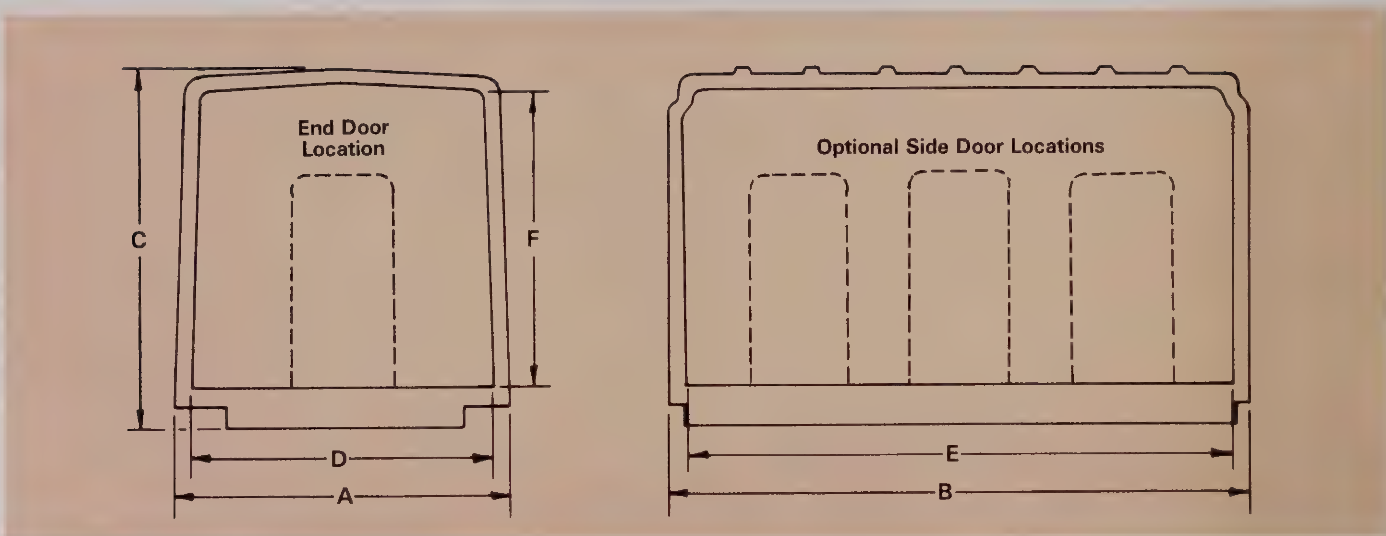
Basic PLASTIDOME Shelter includes the fiberglass-reinforced polyester (FRP) urethane sandwich panel dome, sandwich panel floor, floor tile, one 32 x 72 in (813 x 1829 mm) fiberglass door and a tie down kit. The electrical system and other options are ordered separately.

Options. Standard options are presented on pages 305 and 306. Other options are available on request.

General Services Administration Contract. PLASTIDOME shelters are available under GSA contract.

To Order, specify the "basic shelter" type number and type numbers for all desired options shown on pages 305 and 306.

For Further Information, contact your local Andrew Sales Office listed on the inside back cover and ask for Bulletin 1323.



Ordering Information For PLASTIDOME Shelters

Basic Shelter Type No.	Nominal Outside Dimensions, ft (m) A	B	C	Nominal Inside Dimensions, ft (m) D	E	F	Approx. Weight lb (kg)	Single Phase‡ Basic Electrical System Type No.
GES68-(*)-28	6.0 (1.83)	8.0 (2.44)	9.2 (2.80)	5.4 (1.65)	7.4 (2.26)	8.0 (2.44)	1300 (530)	368016-(**)-1
GES810-(*)-28	8.0 (2.44)	10.0 (3.05)	9.2 (2.80)	7.4 (2.26)	9.4 (2.87)	8.0 (2.44)	2000 (907)	368016-(**)-2
GES810-(*)-29	8.0 (2.44)	10.0 (3.05)	10.5 (3.20)	7.4 (2.26)	9.4 (2.87)	9.2 (2.80)	2200 (998)	368016-(**)-3
GES812-(*)-29	8.0 (2.44)	12.0 (3.65)	10.5 (3.20)	7.4 (2.26)	11.4 (3.48)	9.2 (2.80)	2700 (1225)	368016-(**)-4
GES814-(*)-28	8.0 (2.44)	14.0 (4.27)	9.2 (2.80)	7.4 (2.26)	13.4 (4.09)	8.0 (2.44)	3000 (1361)	368016-(**)-5
GES816-(*)-29†	8.0 (2.44)	16.0 (4.88)	10.5 (3.20)	7.4 (2.26)	15.4 (4.70)	9.2 (2.80)	3600 (1633)	368016-(**)-6
GES1016-(*)-29†	10.0 (3.05)	16.0 (4.88)	10.5 (3.20)	9.4 (2.87)	15.4 (4.70)	9.2 (2.80)	4500 (2041)	368016-(**)-7
GES1020-(*)-29†	10.0 (3.05)	20.0 (6.09)	10.5 (3.20)	9.4 (2.87)	19.4 (5.91)	9.2 (2.80)	5700 (2575)	368016-(**)-8
GES1024-(*)-29†	10.0 (3.05)	24.0 (7.31)	10.5 (3.20)	9.4 (2.87)	23.4 (7.13)	9.2 (2.80)	6900 (3130)	368016-(**)-9
GES1216-(*)-29†	12.0 (3.66)	16.0 (4.87)	10.5 (3.20)	11.4 (3.48)	15.4 (4.70)	9.2 (2.80)	5500 (2495)	368016-(**)-10
GES1224-(*)-29†	12.0 (3.66)	24.0 (7.31)	10.5 (3.20)	11.4 (3.48)	23.4 (7.13)	9.2 (2.80)	8200 (3720)	368016-(**)-11
GES1232-(*)-29†	12.0 (3.66)	32.0 (9.75)	10.5 (3.20)	11.4 (3.48)	31.4 (9.57)	9.2 (2.80)	10900 (4944)	368016-(**)-12

*For "end" door specify "A". For "side" door (centered) specify "B".
† Side doors to the left and right of center are also available upon request.

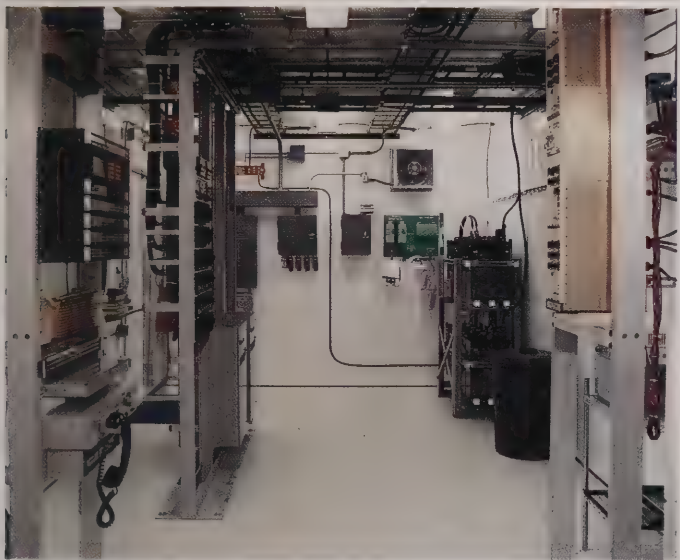
Specify: **43 for 100 amp or **44** for 200 amp.
‡ 3-phase system also available.

Optional Equipment

Standard door options, structural options, environmental control equipment options, Basic Electrical Systems, and electrical equipment options are presented in the following tables. Other options are available on request.

Structural Options – Please Specify

Ice Shielding, Roof	Finished Openings
Bullet Resistance, .22 caliber long rifle, 100 ft (30 m)	PVC Entries
Ohio Compliance Certification	Cable Guides for Helicopter Lift
Color Change (from white)	Partitions
	Partition Door



Typical PLASTIDOME interior with basic electrical system, ventilation system, forced air heating, cable ladders, equipment racks and smoke detector.

Door Options

Description	Dimensions	Type No.
Additional Fiberglass Doors	32 x 72 in (813 x 1829 mm)	**362170**
Bullet Resistant	32 x 72 in (813 x 1829 mm)	**362172**
Larger Size Door	36 x 81 in (914 x 2057 mm)	**322200-1**
Bullet Resistant	36 x 81 in (914 x 2057 mm)	**362202**
Steel Door	36 x 84 in (914 x 2133 mm)	**367981-84**
Open Door Alarm	—	**367959-7**
Dead Bolt Lock	—	**367978-43-1**
Hydraulic Door Closer	—	**367991-8**

Basic Electrical System For Single Phase Service

- AC power entrance elbow, 1-1/4 in, which rotates 360°
- Sixteen circuit load center with 100 amp main breaker and eight breakers, or
- Thirty circuit load center with a 200 amp main breaker and eight breakers
- 125 volt, 20 amp convenience outlets
- Fluorescent interior lights with switch
- One exterior light with 100 watt bulb and switch
- One air conditioner receptacle, 20 amp
- Order from the table on page 304. A three-phase system is also available.

Typical Andrew PLASTIDOME interior with basic electrical system, ventilation system, forced air heating and waveguide boots.

Other Electrical Equipment Options

Description	Type No.
Overhead Power Entry	368016-12
Exterior Light Photocell	D22480
Short Range Lighting and Ventilation System Timer	368016-68-2
Exterior Light Timer	368016-68-1
100A, 240V Manual Transfer Switch	366250-8-2
200A, 240V Manual Transfer Switch	366250-15-2
240V, 60A DPST Fused Safety Switch	366250-10
240V, 100A, DPST Fused Safety Switch	366250-5-2
240V, 200 DPST Fused Safety Switch	366250-43-2
120/240V Surge Arrestor	367989-13
120/240V Surge Arrestor	367989-11
120V Surge Arrestor	367989-14
200A Auxiliary Generator Receptacle	367960-38
100A Auxiliary Generator Receptacle	366969-24
120V Exterior GFI Receptacle	366200-22
Wall-Mounted Insulated Ground Bar	
1/4 x 4 x 20 in (6 x 100 500 mm)	367964-14
1/4 x 1 x 12 in (6 x 25 x 300 mm)	367964-13
Grounding Systems	
Halo Perimeter Grounding	367956-74
Equipment Ground Drop	367956-75-1
External Ground Drop	367956-75-2
Cable Tray/Equipment Grounding	367956-75-3

Miscellaneous Options

Description	Type No.
Smoke Detector	E21595
Fire Extinguisher	
Dry, 5 lb (2.2 kg)	367968-10
Dry, 9 lb (4.1 kg)	367968-30
Carbon Dioxide, 5 lb (2.2 kg)	367968-28
Carbon Dioxide, 10 lb (4.1 kg)	367968-29
Emergency Lights	366176-13
PLASTIDOME Repair Kit	362391
Cable Ladder, 12 in (305 mm) wide	367954-17
Ceiling Support Brackets Use one set every 6 ft (1.8 m)	367954-67
Tee Junction for Cable Ladder	367954-58
Wireway, 4 x 4 in	367974-6
Wireway, 5 ft section	367974-39
90° Elbow	367974-12
Tee Section	367974-21
Closing Plates	367974-2

Environmental Control Equipment*

Description	Type No.
Air Conditioners	
5800 BTU, 115V, 6A	367000
7800 BTU, 115V, 9A	367300-25-1
9500 BTU, 115V, 12A	367300-25-3
9500 BTU, 230/208V, 6A	367100
11,400 BTU, 230/208V, 9A	367300-25-6
16,800 BTU, 230/208V, 9A	367300-25-8
22,900 BTU, 230/208V, 16A	367300-25-10
Baseboard Heating Systems	
500W, 120V	368022-4
750W, 120V	367220
1000W, 120V	367230
1000W, 240V	367983-24
Forced Air Heating Systems	
1500W, 240V	367983-27
3000W, 208V	367983-28
4000W, 240V	367983-29
Ventilation Systems†	
650 cfm (18.4 m^3/m)	368022-1
1000 cfm (28.3 m^3/m)	368022-3
Exhaust Fans with Damper and Rainhood	
650 cfm (18.4 m^3/m)	368022-9
1000 cfm (28.3 m^3/m)	368022-11
Motorized Louvers with Rainhoods	
12 x 12 in (305 x 305 mm)	367979-47
14 x 26 in (355 x 660 mm)	367978-48
Thermostats	
Single Stage	E21590
High Temperature Alarm	367959-9-1
Low Temperature Alarm	367959-9-2
Remote Bulb	E21570
Rainhood for Air Conditioner	
Single A/C with Screen	367966-24
Double A/C with Screen	367966-25
Battery Vent Systems	
12 Cell System	BVS 12
24 Cell System	BVS 24
Other systems available on request	

*Requires Basic Electrical System.

†Ventilation systems include an exhaust fan with damper, motorized louvers, rainhood with filter, rainhood with screen, single stage thermostat, and finished openings.

Field Service

Andrew also provides complete field service capabilities including:

Civil work such as site clearing and grading, access road construction, foundations, fencing and grounding.

Delivery and off loading.

Installation of shelters and on-site power connection.

Andrew field service crew installing a concrete shelter at a terrestrial microwave site.

Andrew concrete shelter containing telephone subscriber carrier equipment offers security and protection.

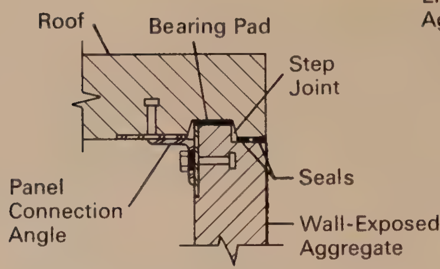
Features and Advantages

- **Great Structural Strength.** The natural strength of concrete is greatly enhanced by the use of steel rebars and wire welded fabric (WWF) throughout. Additional reinforcement is provided around panel edges, openings and lifting plates. The strength of this reinforcement allows the shelters to withstand high winds, high impacts, and heavy loads.
- **Aesthetically Appealing Appearance.** Andrew concrete shelters are aesthetically pleasing and designed to meet or surpass the most stringent local ordinances. An exposed aggregate finish is standard. Fluted and smooth concrete finishes are optional.
- **Bullet, Vandal, and Fire Resistant.** Concrete shelters are capable of withstanding 30-06 caliber rifle fire from point blank range without penetration. Reinforced concrete construction also makes the shelters resistant to structural damage from vandals or fire.
- **Completely Weatherproof.** Each structural panel is impregnated with a chemical moisture barrier to prevent seepage. All panel joints (wall-to-ceiling, wall-to-wall, and wall-to-floor) are double sealed with a permanent no-caulk weather seal and feature a step joint design that provides additional moisture protection. All doorways include a step joint threshold and a drip cap over the top of the jamb to prevent water from entering the shelter.
- **Factory Installed Electrical Equipment.** Concrete shelters can be equipped with a wide selection of factory installed electrical equipment to minimize on-site installation cost and time. Customer-supplied equipment may also be installed and arrangements can be made for customers to test their equipment at the factory.
- **Fast On-Site Installation.** Since the shelters arrive at the site completely assembled and fully equipped, on-site installation time and costs are substantially less than those of built-in-place structures. The shelters include cast in steel lifting plates to facilitate offloading and positioning.

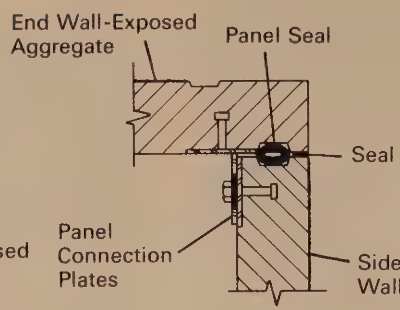
Low Maintenance. Andrew concrete shelters are virtually maintenance free.

- **Available Under General Services Administration (GSA) Contract.** Andrew concrete shelters are available under GSA contract.

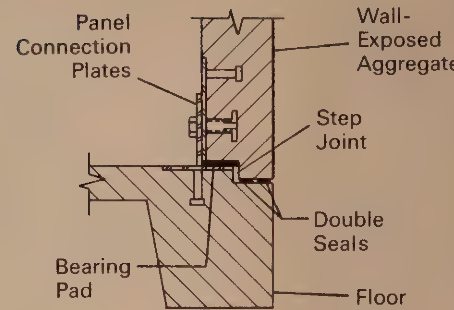
Typical Roof-To-Wall Connection



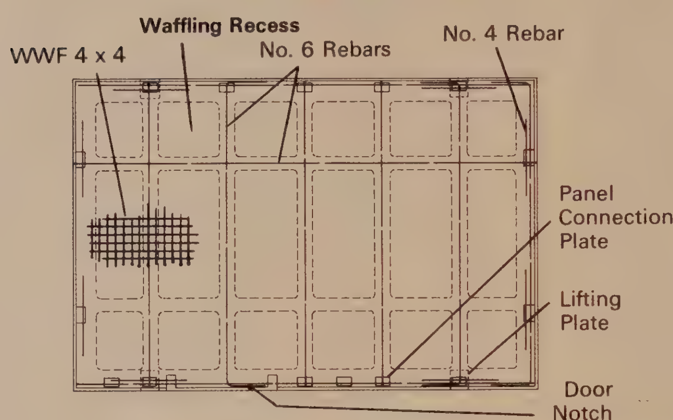
Typical Wall-To-Wall Connection



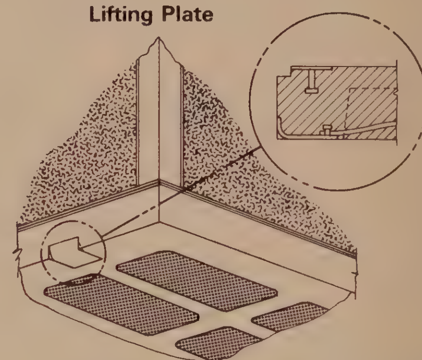
Typical Wall-To-Floor Connection



Typical Waffle Panel Floor

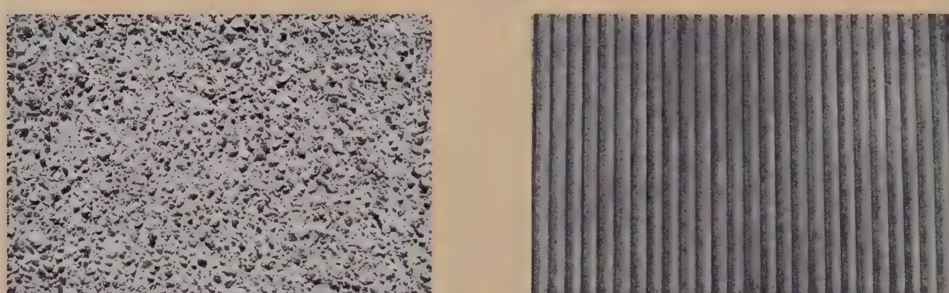


Lifting Plate



Reinforced lifting plates are recessed into the floor for positive capture and easy removal of lifting straps

Exterior Finishes



Exposed aggregate (left) is standard. Fluted (right), smooth (not shown) and other finishes are optional

Construction

Each concrete shelter consists of the following:

Flat Panel Roof. The roof is a flat panel of reinforced concrete 4 inches (100 mm) thick, with a 1/8 inch (3 mm) per foot (0.3 m) pitch for drainage. Reinforcement consists of No. 4 rebars and welded wire fabric (WWF) throughout.

Flat Panel Walls. The walls are flat panels of reinforced concrete 4 inches (100 mm) thick. Reinforcement consists of No. 4 rebars and No. 4 wire, WWF.

Waffle Panel Floor. The floor is an 8 inch (200 mm) deep waffle slab of reinforced concrete. The waffling is formed by longitudinal ribs, and transverse ribs. Reinforcement consists of No. 6 rebars through each rib and around the edges of the panel. No. 4 rebars provide additional reinforcement around the panel connection plates, and the floor deck is reinforced with No. 4 wire, WWF.

Panel Connections. Steel panel connection plates are cast into the roof, wall, and floor panels and welded together after assembly and panel alignment.

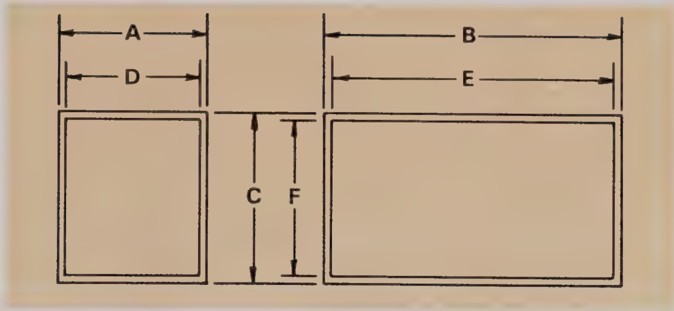
Ordering Information

Basic Concrete Shelter includes the reinforced concrete structure with an exposed aggregate finish and one 36 x 80 in (914 x 2032 mm) steel door. Electrical system and all other options are ordered separately.

Options. Standard options are presented on pages 310 and 311. Other options are available on request.

General Services Administration Contracts. Concrete shelters are available under GSA contract.

To Order. To order, specify the "basic shelter" type number and type numbers for all desired options shown below.



Ordering Information For Concrete Shelters

Basic Shelter Type No.	Nominal Outside Dimensions, ft (m) Width A	Length B	Height C	Nominal Inside Dimensions, ft (m) Width D	Length E	Height F	Approx. Weight lb (kg)	Single Phase† Basic Electrical System Type No.
FCS68-(*)-28	6.0 (1.83)	8.0 (2.44)	9.0 (2.44)	5.3 (1.61)	7.3 (2.22)	8.0 (2.13)	10380 (4672)	368016-(**)-20
FCS810-(*)-28	8.0 (2.44)	10.0 (3.05)	9.0 (2.74)	7.3 (2.22)	9.3 (2.83)	8.0 (2.44)	17320 (7856)	368016-(**)-21
FCS810-(*)-29	8.0 (2.44)	10.0 (3.05)	10.0 (3.05)	7.3 (2.22)	9.3 (2.83)	9.0 (2.74)	18710 (8487)	368016-(**)-22
FCS812-(*)-28	8.0 (2.44)	12.0 (3.66)	9.0 (2.74)	7.3 (2.22)	11.3 (3.44)	8.0 (2.44)	19900 (9026)	368016-(**)-23
FCS812-(*)-29	8.0 (2.44)	12.0 (3.66)	10.0 (3.05)	7.3 (2.22)	11.3 (3.44)	9.0 (2.74)	21450 (9730)	368016-(**)-24
FCS814-(*)-28	8.0 (2.44)	14.0 (4.27)	9.0 (2.74)	7.3 (2.22)	13.3 (4.05)	8.0 (2.44)	22560 (10233)	368016-(**)-25
FCS814-(*)-29	8.0 (2.44)	14.0 (4.27)	10.0 (3.05)	7.3 (2.22)	13.3 (4.05)	9.0 (2.74)	24260 (11004)	368016-(**)-26
FCS816-(*)-28	8.0 (2.44)	16.0 (4.88)	9.0 (2.74)	7.3 (2.22)	15.3 (4.66)	8.0 (2.44)	25080 (11340)	368016-(**)-27
FCS816-(*)-29	8.0 (2.44)	16.0 (4.88)	10.0 (3.05)	7.3 (2.22)	15.3 (4.66)	9.0 (2.74)	26950 (12224)	368016-(**)-28
FCS1012-(*)-29	10.0 (3.05)	12.0 (3.66)	10.0 (3.05)	9.3 (2.83)	11.3 (3.44)	9.0 (2.74)	24950 (11317)	368016-(**)-29
FCS1014-(*)-29	10.0 (3.05)	14.0 (4.27)	10.0 (3.05)	9.3 (2.83)	13.3 (4.05)	9.0 (2.74)	28030 (12714)	368016-(**)-30
FCS1016-(*)-29	10.0 (3.05)	16.0 (4.88)	10.0 (3.05)	9.3 (2.83)	15.3 (4.66)	9.0 (2.74)	31110 (14111)	368016-(**)-31
FCS1020-(*)-29	10.0 (3.05)	20.0 (6.09)	10.0 (3.05)	9.3 (2.83)	19.3 (5.88)	9.0 (2.74)	37390 (16960)	368016-(**)-32
FCS1024-(*)-29	10.0 (3.05)	24.0 (7.31)	10.0 (3.05)	9.3 (2.83)	23.3 (7.10)	9.0 (2.74)	43430 (19700)	368016-(**)-33
FCS1212-(*)-29	12.0 (3.66)	12.0 (3.66)	10.0 (3.05)	11.3 (3.44)	11.3 (3.44)	9.0 (2.74)	23990 (10882)	368016-(**)-34
FCS1216-(*)-29	12.0 (3.66)	16.0 (4.88)	10.0 (3.05)	11.3 (3.44)	15.3 (4.66)	9.0 (2.74)	35080 (15876)	368016-(**)-35
FCS1220-(*)-29	12.0 (3.66)	20.0 (6.09)	10.0 (3.05)	11.3 (3.44)	19.3 (5.88)	9.0 (2.74)	41990 (19046)	368016-(**)-36
FCS1224-(*)-29	12.0 (3.66)	24.0 (7.31)	10.0 (3.05)	11.3 (3.44)	23.3 (7.10)	9.0 (2.74)	48890 (22176)	368016-(**)-37
FCS1228-(*)-29	12.0 (3.66)	28.0 (8.53)	10.0 (3.05)	11.3 (3.44)	27.3 (8.32)	9.0 (2.74)	55810 (25315)	368016-(**)-38

*For "end" door specify "A". For centered "side" door specify "B".
†3-phase system also available.
Specify: **41 for 100 amp, **42** for 200 amp.

Insulated and finished concrete shelter interior.

Concrete shelter with partition and additional steel door option.

Optional Equipment

Standard door options, structural options, environmental control equipment options, basic electrical systems, and electrical equipment options are presented in the following tables. Other options are available on request.

Door Options

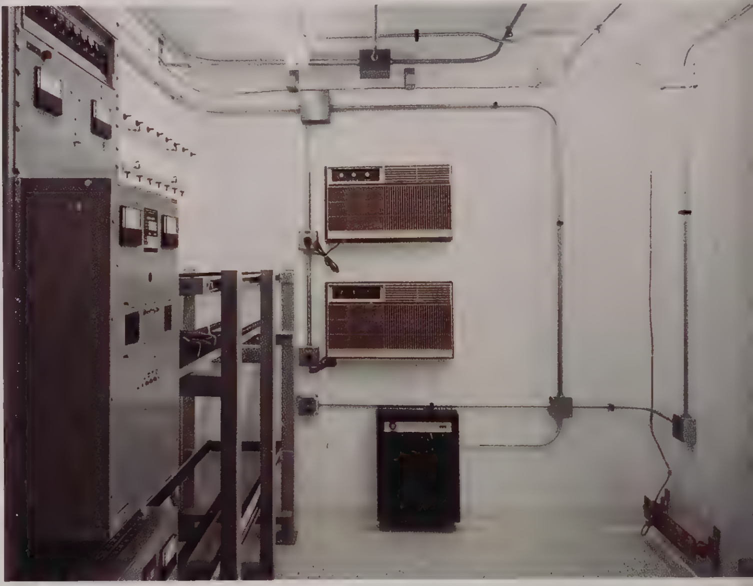
Description	Type No.
Additional Steel Door 36 x 80 in (914 x 2032 mm)	**367981-100-5**
Open Door Alarm	**367959-8**
Lock Guard	**379890-12**
Hydraulic Door Closer	**367991-8**

Structural Options – Please Specify

Floor Tile	Partitions
Insulation	Partition Door
Waveguide Openings	Exterior Finishes
Tie Down Hardware	

Basic Electrical System For Single Phase Service

- AC power entrance elbow, 1-1/4 in, which rotates 360°
- Sixteen circuit load center with 100 amp main breaker and eight breakers, or
- Thirty circuit load center with a 200 amp main breaker and eight breakers
- 125 volt, 20 amp convenience outlets
- Fluorescent interior lights with switch
- One exterior light with 100 watt bulb and switch
- One air conditioner receptacle, 20 amp
- Order from the table on page 309. A three-phase system is also available.



Typical concrete shelter with basic electrical system, air conditioner and forced air heating system.

Fiber optic repeater station with typical Andrew concrete interior including basic electrical system, air conditioning and forced air heating systems, and cable ladders.

Other Electrical Equipment Options

Description	Type No.
Overhead Power Entry	368016-12
Exterior Light Photocell	D22480
Short Range Lighting and Ventilation System Timer	368016-68-2
Exterior Light Timer	368016-68-1
100A, 240V Manual Transfer Switch	366250-8-2
200A, 240V Manual Transfer Switch	366250-15-2
240V, 60A DPST Fused Safety Switch	366250-10
240V, 100A, DPST Fused Safety Switch	366250-5-2
240V, 200 DPST Fused Safety Switch	366250-43-2
120/240V Surge Arrestor	367989-13
120/240V Surge Arrestor	367989-11
120V Surge Arrestor	367989-14
200A Auxiliary Generator Receptacle	367960-38
100A Auxiliary Generator Receptacle	366969-24
120V Exterior GFI Receptacle	366200-22
Wall-Mounted Insulated Ground Bar	
1/4 x 4 x 20 in (6 x 100 500 mm)	367964-14
1/4 x 1 x 12 in (6 x 25 x 300 mm)	367964-13
Grounding Systems	
Halo Perimeter Grounding	367956-72
Equipment Ground Drop	367956-73-1
External Ground Drop	367956-73-2
Cable Tray/Equipment Grounding	367956-73-3

Miscellaneous Options

Description	Type No.
Smoke Detector	E21595
Fire Extinguisher	
Dry, 5 lb (2.2 kg)	367968-10
Dry, 9 lb (4.1 kg)	367968-30
Carbon Dioxide, 5 lb (2.2 kg)	367968-28
Carbon Dioxide, 10 lb (4.1 kg)	367968-29
Emergency Lights	366176-13
Cable Ladder, 12 in (305 mm) wide	367954-17
Ceiling Support Brackets Use one every 6 ft (1.8 m)	367954-67
Tee Junction for Cable Ladder	367954-58
Wireway, 4 x 4 in, 5 ft section	367974-39
90° Elbow	367974-12
Tee Section	367974-21
Closing Plates	367974-2

Environmental Control Equipment*

Description	Type No.
Air Conditioners	
5800 BTU, 115V, 6A	367300-25-12
7800 BTU, 115V, 9A	367300-25-2
9500 BTU, 115V, 12A	367300-25-4
9500 BTU, 230/208V, 6A	367300-25-5
11,400 BTU, 230/208V, 9A	367300-25-7
16,800 BTU, 230/208V, 9A	367300-25-9
22,900 BTU, 230/208V, 16A	367300-25-11
Baseboard Heating Systems	
500W, 120V	368022-4
750W, 120V	367220
1000W, 120V	367230
1000W, 240V	367983-24
Rainhood for Air Conditioner	
Single A/C with Screen	367966-24
Double A/C with Screen	367966-25
Forced Air Heating Systems	
1500W, 240V	367983-27
3000W, 208V	367983-28
4000W, 240V	367983-29
Ventilation Systems†	
650 cfm (18.4 m^3/m)	368022-18-1
1000 cfm (28.3 m^3/m)	368022-18-2
Exhaust Fans with Damper and Rainhood	
650 cfm (18.4 m^3/m)	368022-9
1000 cfm (28.3 m^3/m)	368022-11
Motorized Louvers with Rainhoods	
12 x 12 in (305 x 305 mm)	367979-47
14 x 26 in (355 x 660 mm)	367978-48
Thermostats	
Single Stage	E21590
High Temperature Alarm	367959-9-1
Low Temperature Alarm	367959-9-2
Remote Bulb	E21570

*Requires Basic Electrical System.

†Ventilation systems include an exhaust fan with damper, motorized louvers, rainhood with filter, rainhood with screen, single stage thermostat, and finished openings.

Field Service

Andrew also provides complete field service capabilities including:

Civil work such as site clearing and grading, access road construction, fencing and grounding.

Delivery and off loading.

Installation of shelters and on-site power connection.

Definitions

Return loss, RL, is the decibel power ratio of the incident power to the reflected power.

Reflection coefficient, $|\Gamma|$, is the numerical ratio of the reflected voltage to the incident voltage.

Voltage Standing Wave Ratio, VSWR, is the numerical ratio of the maximum voltage to the minimum voltage that would exist on the uniform reference transmission line.

Calculation of System VSWR

A method for calculating system VSWR is presented on page 8.

Conversion Formulas

The following formulas can be used for determining values not listed in the table below.

$$RL = -20 \log_{10} (|\Gamma|)$$

$$|\Gamma| = \frac{VSWR - 1}{VSWR + 1}$$

$$|\Gamma| = \text{antilog}_{10} \left(-\frac{RL}{20}\right)$$

$$VSWR = \frac{1 + |\Gamma|}{1 - |\Gamma|}$$

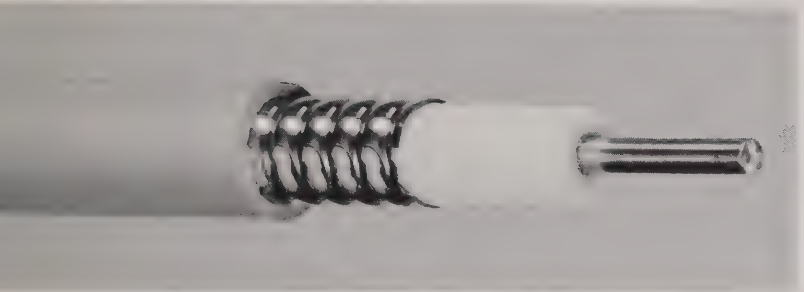
Conversion Table

Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR
14.0	19.95	1.50	22.0	7.943	1.173	30.0	3.162	1.065	38.0	1.259	1.025
14.2	19.50	1.48	22.2	7.762	1.168	30.2	3.090	1.064	38.2	1.230	1.025
14.4	19.05	1.47	22.4	7.586	1.164	30.4	3.020	1.062	38.4	1.202	1.024
14.6	18.62	1.46	22.6	7.413	1.160	30.6	2.951	1.061	38.6	1.175	1.024
14.8	18.20	1.44	22.8	7.244	1.156	30.8	2.884	1.059	38.8	1.148	1.023
15.0	17.78	1.43	23.0	7.079	1.152	31.0	2.818	1.058	39.0	1.122	1.023
15.2	17.38	1.42	23.2	6.918	1.149	31.2	2.754	1.057	39.2	1.096	1.022
15.4	16.98	1.41	23.4	6.761	1.145	31.4	2.692	1.055	39.4	1.072	1.022
15.6	16.60	1.40	23.6	6.607	1.141	31.6	2.630	1.054	39.6	1.047	1.021
15.8	16.22	1.39	23.8	6.457	1.138	31.8	2.570	1.053	39.8	1.023	1.021
16.0	15.85	1.38	24.0	6.310	1.135	32.0	2.512	1.052	40.0	1.000	1.020
16.2	15.49	1.37	24.2	6.166	1.131	32.2	2.455	1.050	40.2	0.9772	1.020
16.4	15.14	1.36	24.4	6.026	1.128	32.4	2.399	1.049	40.4	0.9550	1.019
16.6	14.79	1.35	24.6	5.888	1.125	32.6	2.344	1.048	40.6	0.9333	1.019
16.8	14.45	1.34	24.8	5.754	1.122	32.8	2.291	1.047	40.8	0.9120	1.018
17.0	14.13	1.33	25.0	5.623	1.119	33.0	2.239	1.046	41.0	0.8913	1.018
17.2	13.80	1.32	25.2	5.495	1.116	33.2	2.188	1.045	41.2	0.8710	1.018
17.4	13.49	1.31	25.4	5.370	1.114	33.4	2.138	1.044	41.4	0.8511	1.017
17.6	13.18	1.30	25.6	5.248	1.111	33.6	2.089	1.043	41.6	0.8318	1.017
17.8	12.88	1.30	25.8	5.129	1.108	33.8	2.042	1.042	41.8	0.8128	1.016
18.0	12.59	1.29	26.0	5.012	1.106	34.0	1.995	1.041	42.0	0.7943	1.016
18.2	12.30	1.28	26.2	4.898	1.103	34.2	1.950	1.040	42.2	0.7762	1.016
18.4	12.02	1.27	26.4	4.786	1.101	34.4	1.905	1.039	42.4	0.7586	1.015
18.6	11.75	1.27	26.6	4.677	1.098	34.6	1.862	1.038	42.6	0.7413	1.015
18.8	11.48	1.26	26.8	4.571	1.096	34.8	1.820	1.037	42.8	0.7244	1.015
19.0	11.22	1.25	27.0	4.467	1.094	35.0	1.778	1.036	43.0	0.7079	1.014
19.2	10.96	1.25	27.2	4.365	1.091	35.2	1.738	1.035	43.2	0.6918	1.014
19.4	10.72	1.24	27.4	4.266	1.089	35.4	1.698	1.035	43.4	0.6761	1.014
19.6	10.47	1.234	27.6	4.169	1.087	35.6	1.660	1.034	43.6	0.6607	1.013
19.8	10.23	1.228	27.8	4.074	1.085	35.8	1.622	1.033	43.8	0.6457	1.013
20.0	10.00	1.222	28.0	3.981	1.083	36.0	1.585	1.032	44.0	0.6310	1.013
20.2	9.772	1.217	28.2	3.890	1.081	36.2	1.549	1.031	44.2	0.6166	1.012
20.4	9.550	1.211	28.4	3.802	1.079	36.4	1.514	1.031	44.4	0.6026	1.012
20.6	9.333	1.206	28.6	3.715	1.077	36.6	1.479	1.030	44.6	0.5888	1.012
20.8	9.120	1.201	28.8	3.631	1.075	36.8	1.445	1.029	44.8	0.5754	1.012
21.0	8.913	1.196	29.0	3.548	1.074	37.0	1.413	1.029	45.0	0.5623	1.011
21.2	8.710	1.191	29.2	3.467	1.072	37.2	1.380	1.028	45.2	0.5495	1.011
21.4	8.511	1.186	29.4	3.388	1.070	37.4	1.349	1.027	45.4	0.5370	1.011
21.6	8.318	1.181	29.6	3.311	1.068	37.6	1.318	1.027	45.6	0.5248	1.011
21.8	8.128	1.177	29.8	3.236	1.067	37.8	1.288	1.026	45.8	0.5129	1.010

RADIAX® SLOTTED COAXIAL CABLE SYSTEM DESIGN CONSIDERATIONS

Bulletin 1058E

ANDREW



RADIAX slotted coaxial cable* is designed to function as a continuous antenna. The slots in the corrugated copper cable allow a controlled portion of the transmitted RF signal to radiate along the entire length of the cable. Conversely, a signal transmitted near RADIAX will couple into these slots and be carried along the cable. Because of its broadband capability, a single RADIAX system can simultaneously handle two or more complete communications systems. Accumulated dirt, oil and moisture have no appreciable effect on attenuation. This results in a low-cost maintenance-free installation.

The standard jacketing material is brown polyethylene. Fire-retardant cables are concrete gray in color and are listed by Underwriters' Laboratories, Inc.

Coupling loss is the average difference between signal level in the cable and the signal received by a zero dBd gain antenna. Attenuation is affected by mounting methods and surface. Nominal values are given in the characteristics table for RADIAX in free space and when mounted on concrete.

MECHANICAL CHARACTERISTICS

Nominal Size	1/2"	7/8"
Outer Conductor dia., in	0.540	0.980
(mm)	(13.8)	(24.9)
Diameter, over jacket, in	0.620	1.10
(mm)	(15.8)	(27.8)
Minimum Bending Radius, in	5	10
(mm)	(127)	(254)
Cable Weight, pounds per ft	0.16	0.44
(kg/m)	(0.238)	(0.655)

ELECTRICAL CHARACTERISTICS

Type No. with standard jacketing	**RX4-1**	**RX4-2A**	**RX4-3A**	**RX5-1**
Type No. with fire retardant jacketing	**RX4-1R**	**RX4-2R**	**RX4-3R**	**RX5-1R**
Nominal Size	1/2"	1/2"	1/2"	7/8"
Impedance, ohms	50	50	50	50
Velocity, percent	79	79	79	79
Typical VSWR, 30, 150, 450, 900 MHz	1.3	1.3	1.3	1.3
Attenuation, Nominal, in free space				
30 MHz, dB/100 ft (dB/100 m)	0.45 (1.47)	0.5 (1.64)	0.9 (2.95)	0.24 (0.78)
150 MHz, dB/100 ft (dB/100 m)	1.1 (3.60)	1.3 (4.27)	1.9 (6.23)	0.6 (1.96)
450 MHz, dB/100 ft (dB/100 m)	2.1 (6.89)	2.4 (7.87)	4.0 (13.12)	1.2 (3.93)
900 MHz, dB/100 ft (dB/100 m)	3.2 (10.50)	3.6 (11.81)	6.0 (19.69)	1.9 (6.23)
Attenuation, Nominal, mounted directly to concrete				
30 MHz, dB/100 ft (dB/100 m)	0.45 (1.47)	0.5 (1.64)	0.9 (2.95)	0.24 (0.78)
150 MHz, dB/100 ft (dB/100 m)	1.1 (3.60)	1.4 (4.59)	4.0 (13.1)	0.7 (2.29)
450 MHz, dB/100 ft (dB/100 m)	2.3 (7.54)	3.2 (10.50)	15.0 (49.2)	1.5 (4.92)
900 MHz, dB/100 ft (dB/100 m)	4.1 (13.45)	6.4 (21.00)	30.0 (98.4)	2.3 (7.55)
Coupling Loss at 20 ft (6.1 m), dB, ±10 dB				
30 MHz	85	80	77	95
150 MHz	75	67	57	70
450 MHz	85	75	61	80
900 MHz	82	74	68	80
Average Power Rating, kW				
30 MHz	4.3	4.3	4.3	9.0
150 MHz	1.7	1.7	1.7	3.7
450 MHz	0.9	0.9	0.9	1.9
900 MHz	0.6	0.6	0.6	1.3

*Patented Australia 458,342; United States 3,691,488; Canada 929,243; United Kingdom 1,294,258
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Andrew Antenna Company Ltd Whitby, Ontario, Canada

Andrew Antennas Campbellfield, Victoria, Australia

Andrew AG Zurich, Switzerland

Andrew Antenas Limitada Sorocaba, SP, Brazil

Antenas de Transmisión S.A. de C. V México, D.F. México

Antennes Andrew S.A.R.L. Buc, France

Andrew Corporation Tokyo, Japan

Andrew GmbH Munich, West Germany

Andrew S.R.L. Milan, Italy

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CONNECTORS

Type N connectors are recommended for 30, 150, 450 and 900 MHz. UHF connectors are suitable for 30 and 150 MHz.

CONNECTOR TYPE NUMBERS

Connector Type	For 1/2" RADIAX	For 7/8" RADIAX	For 1/2" LDF Series HELIAX	For 7/8" LDF Series HELIAX	For 1/2" Superflex HELIAX
N Jack (female)	**44AN**	**45AN**	**L44N**	**L45N**	**44ASN**
N Plug (male)	**44AW**	**45AW**	**L44W**	**L45W**	**44ASW**
UHF Jack (female)	**44AU**	**45AU**	**L44U**	**L45U**	**44ASU**
UHF Plug (male)	**44AP**	**45AP**	**L44P**	**L45P**	**44ASP**

POWER SPLITTING

Power Splitters. The units listed in the table include 50-ohm impedance transformers. 30-MHz splitters are mounted in 10 x 12 x 3 in (254 x 305 x 76 mm) aluminum cabinets.

Tee does not include impedance transformer. Jack-Plug-Jack
Type N . . . Type **10804-16**
UHF . . . . Type **10805-4**

Power Splitter	Frequency	2-Way	3-Way	4-Way	Input Type	Output Type
Type No.	30 MHz	**42155**	**42156**	**42157**	UHF Jack	UHF Jack
	150 MHz	**42192**	**42193A**	**42194**	UHF Plug	UHF Jack
	450 MHz	**42152**	**42153**	**42154**	N Plug	N Jack
	900 MHz	**44612**	**44613**	**44614**	N Plug	N Jack
Splitter Loss	All	3 dB	5 dB	6 dB	–	–

FIRE-RETARDANT HELIAX® FLEXIBLE COAXIAL CABLES

Fire retardant, foam-dielectric HELIAX cables (not shown) are for routing through areas where coverage is not required. These cables are listed by Underwriters' Laboratories, Inc. The electrical and mechanical characteristics are described in our General Catalog.

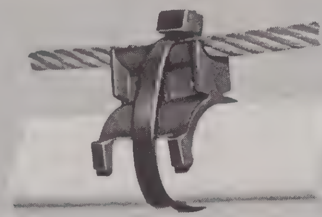
Each has 50-ohm impedance, a copper outer conductor and a foam dielectric. Select connectors from the above table.

1/2" LDF Series foam HELIAX . . . . Type **41690-8**
7/8" LDF Series foam HELIAX . . . . Type **41690-9**
1/2" Superflexible HELIAX . . . . Type **41690-24**

MOUNTING

RADIAX® can be mounted directly against a non-conductive surface with metal hangers. For mounting on continuous metal surfaces, such as channels and messenger cables, insulated hangers with 0.5 in (13 mm) standoff are required. Direct mounting on continuous metal surfaces is not recommended. Hangers with a 2 in (50 mm) standoff are recommended for mounting Types **RX4-3A** and **RX4-3R** on concrete. In all of the above cases, the free space attenuation figures apply. When RADIAX is mounted directly on a conductive or a lossy (such as concrete) surface, line attenuation may increase, compared with the free space values. The attenuation values for free space and for direct mounting on concrete are listed on page 1.

Horizontal and vertical runs should be supported at 5 ft (1.5 m) intervals, but the spacing should be reduced to 3 ft (1 m) on top of metal members or on horizontal messenger cables.



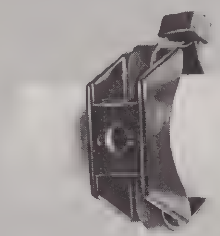
Insulated Messenger Cable Hanger Kit of 10, with 0.5 in (13 mm) standoffs for 1/2" or 7/8" RADIAX . . . . Type **36720**

Metal Hanger Kit of 10 1/4" mounting hardware not included.

Plated Steel
for 1/2" RADIAX . . . . Type **40954-1**
for 7/8" RADIAX . . . . Type **40785-1**

Stainless Steel
for 1/2" RADIAX . . . . Type **40954-2**
for 7/8" RADIAX . . . . Type **40785-2**

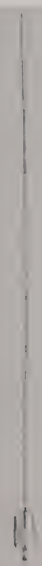
Standoff Hanger Kit of 10. Provide 2 in (50 mm) standoff for 1/2" or 7/8" RADIAX. 1/4" — 20 x 3 in machine screws included . . . . Type **43042**



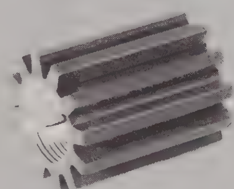
Insulated Hanger Kit of 10, with 0.5 in (13 mm) standoffs for 1/2" or 7/8" RADIAX. 1/4" mounting hardware not included . . . . Type **36719**

TERMINATIONS

An antenna can be used to terminate the RADIAX and provide additional coverage at the end of the cable. Alternatively, terminating loads can be used to provide a suitable impedance match for the base station transmitter and/or receiver. For long runs, the RADIAX attenuation serves to reduce the open circuit VSWR. For example, 10 dB of line loss reduces the VSWR of an open circuit to 1.25. If this value is acceptable, a terminating load will not be required. For short runs, a 50-ohm load is usually needed.



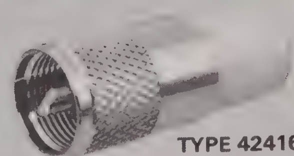
150 or 450 MHz Whip Antenna for coverage outside building or large inside area. UHF plug (male) input. 17.4 in (442 mm) . . . . Type **42419**



TYPE 32299-6

TYPE 32299-5

50-ohm Load to terminate RADIAX cable run.
25-watt, Type N plug, (male) input . . . . Type **32299-6**
10-watt, Type N jack, (female) input . . . . Type **32299-5**
2-watt, UHF plug (male) input . . . . . . Type **42416**



TYPE 42416

FIGURE 1 — 2-WAY SPLIT

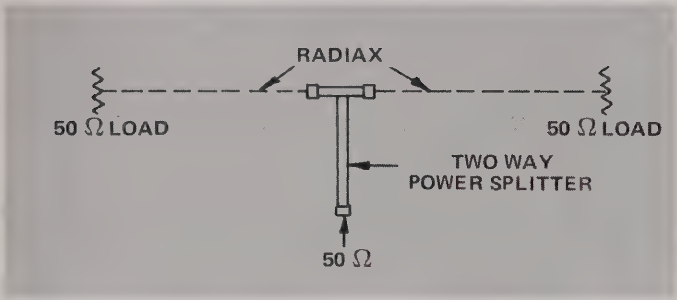


FIGURE 2 — 4-WAY SPLIT USING THREE 2-WAY SPLITTERS

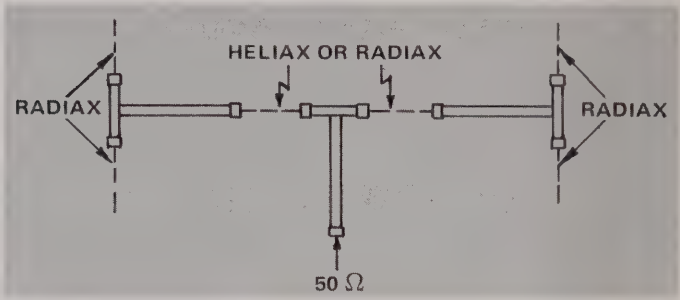


FIGURE 3 — COUPLING LOSS VS. DISTANCE

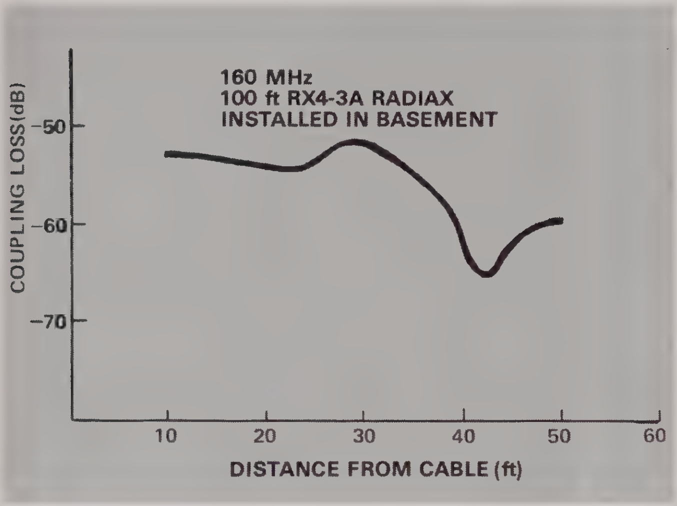


FIGURE 4 — COUPLING LOSS VS. DISTANCE

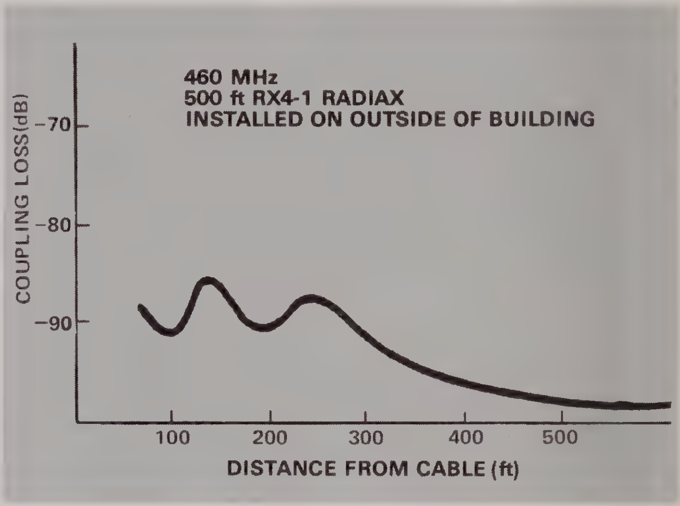
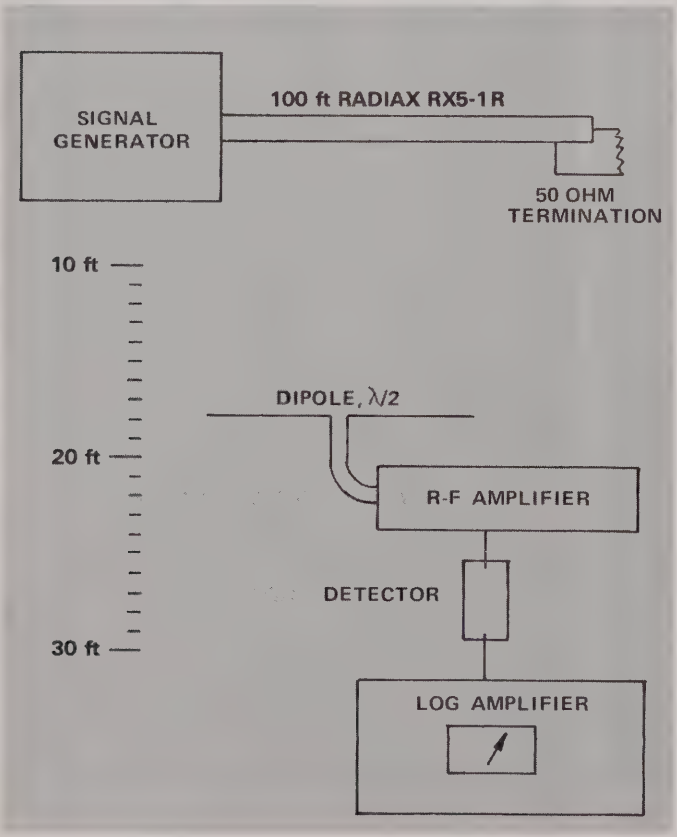


FIGURE 5 — COUPLING LOSS MEASUREMENT



SYSTEM DESIGN

The primary objective in the design of a RADIAX® system is to provide an adequate signal at all points in the system. Once the preliminary routing layout has been prepared, the system should be analyzed to determine if coverage is adequate. For one-way applications, such as paging, calculations must be performed from the base station to the portable. In two-way applications, such as security communications, calculations must be performed from both base to portable unit and portable to base. Normally, portable to base is more critical due to the low transmit power level of the hand-held unit.

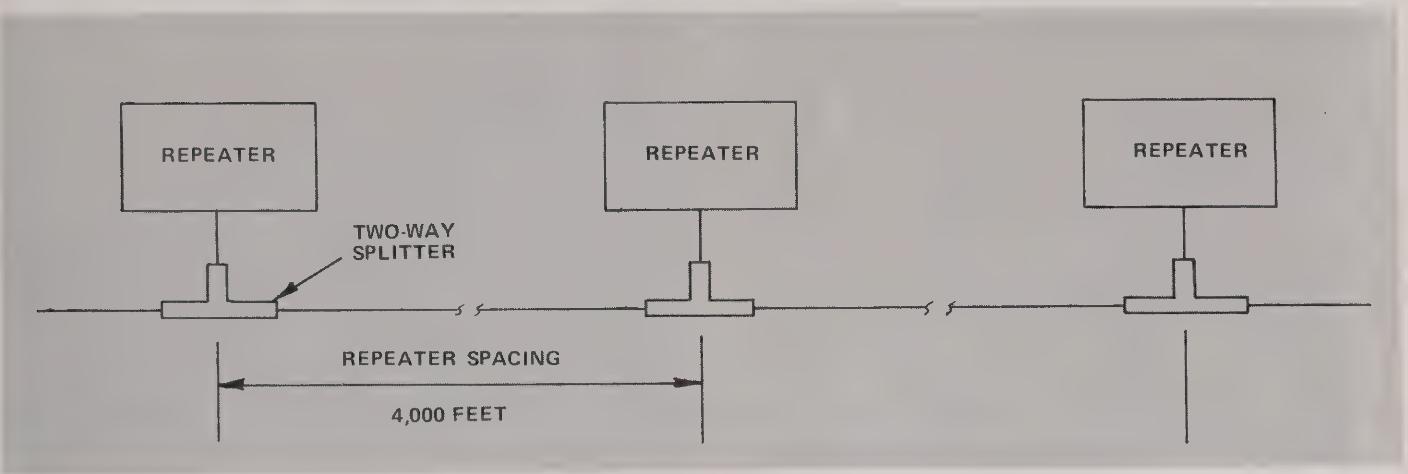
Power Splitting

Power splitters are available as complete units or can be constructed using a simple tee and a separate impedance transformer. Splitters introduce the same insertion loss in talk-back as in talk-out. Typical applications of power splitters are illustrated in Figures 1 and 2.

Coupling Loss

Coupling Loss is the average difference between signal level in the cable and the power received by a zero dBd gain antenna. Coupling loss is specified in dB at a dis-

FIGURE 6 — RADIAX TUNNEL INSTALLATION SIMPLEX SYSTEM USING 1/2" RADIAX



tance of 20 ft (6.1 m) from the RADIAX®. A tolerance of ±10 dB is specified, since the value can vary significantly with small changes in distance. Typical variations in enclosed and open areas are shown in Figures 3 and 4. For calculation purposes, add 6 dB each time distance from the cable is doubled in large open areas.

Coupling loss can be measured using the test set-up shown in Figure 5. Signal level in the cable is measured by connecting the amplifier/detector in place of the 50-ohm termination. Signal strength is measured at intervals from 10-30 ft (3-10 m). The average of these measurements yields the coupling loss at 20 ft (6.1 m).

Polarization

Both horizontally and vertically polarized signals are radiated. In enclosed areas, RADIAX can be used with an antenna oriented in any direction. In open areas, polarization varies from horizontal to vertical in a random manner. Hand orientation of portable units may be required to maximize signals.

Cable Orientation

The performance of RADIAX is not affected by slot orientation. Alignment of the slots is, therefore, unnecessary.

Multipath Interference

When a single run of RADIAX is fed from two transmitters, multipath interference can occur where signals overlap. In paging and voice communications, the multipath is of little consequence. However, in digital communications this effect can cause significant signal distortion. Multipath interference can be prevented by physically separating ends of runs or by using suitable filters, chokes or cross-band couplers.

Routing

In general, RADIAX should be routed wherever coverage is required. In areas requiring substantial protection against vandalism, RADIAX can be enclosed in PVC tubing. For short distances, such as between floors or bulkheads, RADIAX can be routed through standard metal conduit without appreciable degradation of overall performance. For long enclosed runs, or for areas where coverage is not desired, 1/2" or 7/8" LDF Series HELIAX® cables are recomended. Superflexible HELIAX cable is available for use in equipment cabinets or in other close quarters. These cables are all available with standard polyethylene or fire-retardant jackets.

Mines, Subways and Tunnels

Communication systems in mines, subways and tunnels are characterized by long distances over which coverage is required. The portable radio equipment is usually close to the RADIAX because of the limited cross-sectional area of most tunnels. For these systems Types **RX4-1**, **RX5-1**, **RX4-1 R** and **RX5-1 R** are recommended. These RADIAX cables have low signal radiation and, therefore, low attenuation. The 7/8" RADIAX cables, Types **RX5-1** and **RX5-1 R** are recommended for very long runs where the lowest attenuation is required. A typical tunnel RADIAX installation is shown in Figure 6.

In vehicular tunnels, the RADIAX is normally mounted on the wall at the same height as the vehicle-mounted antenna. In pedestrian tunnels, RADIAX is normally mounted sufficiently high on a wall to preclude vandalism.

Both RADIAX and HELIAX can be supplied on small-diameter, light-weight reels to facilitate handling in tunnels.

Paging Systems

The optimum cable type for paging systems is dependent on the length of the run and can be selected from the following table:

Recommended Cable Types	150 MHz	450 MHz	900 MHz
RX4-3A, RX4-3R	to 385 ft (115 m)	to 120 ft (35 m)	to 25 ft (8 m)
RX4-2A, RX4-2R	385-2660 ft (115-810 m)	120-1110 ft (35-335 m)	25-350 ft (8-106 m)
RX4-1, RX4-1R	over 2660 ft (810 m)	over 1110 ft (335 m)	over 350 ft (106 m)

For best building coverage, the RADIAX® should be installed vertically in a non-metallic lined elevator or utility shaft. To provide uniform coverage, the shaft should be as close as possible to the center of the building. For buildings with large cross-sectional areas, more than one vertical run may be required. If the building is of steel-reinforced construction, preliminary penetration tests should be made. Some penetration of this type of construction occurs at 450 MHz, but considerable attenuation may be introduced. The base station may be located at any convenient spot: top, bottom or on an intermediate floor of the building. Figure 7 shows a typical installation.

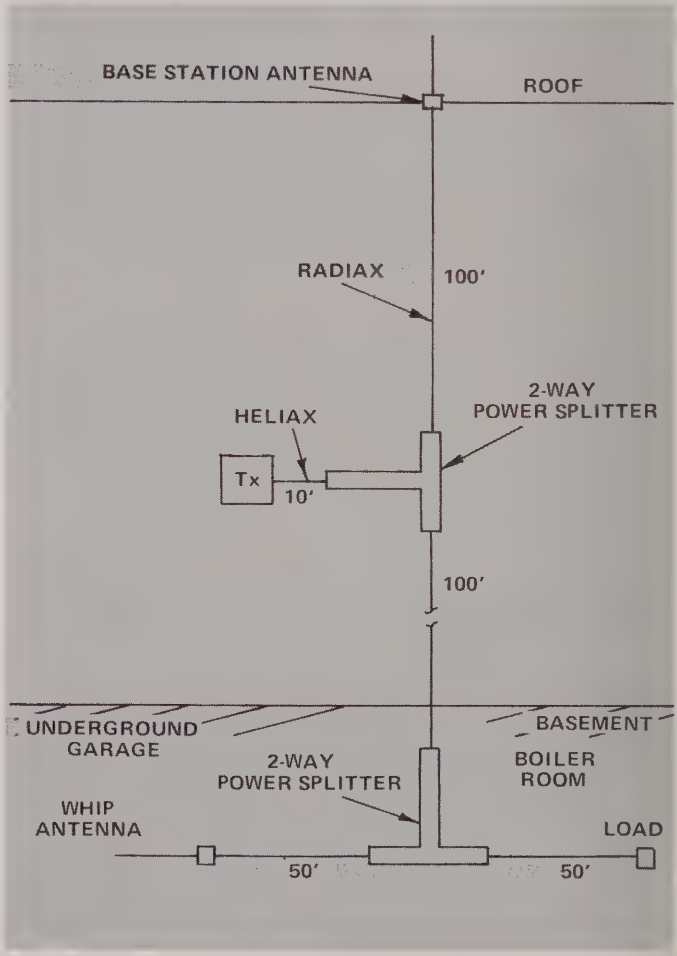
RADIAX can be used to provide coverage in areas shielded from the main building. Examples are a boiler room in the basement, an area shielded by a large array of metal ductwork, etc., or a heavily-reinforced underground parking garage.

Travelers Information Stations/Highway Advisory Radio (TIS/HAR). RADIAX slotted coaxial cable Type **RX4-3A** is ideal for highly-localized broadcasting. Its rugged construction withstands rough handling during installation. The copper outer conductor presents a formidable barrier against rodent attack for a long-life, maintenance-free system. A flooding compound between the jacket and outer conductor precludes water migration should the jacket become damaged. RADIAX cable is suitable for direct burial. In soil containing rock, the cable should be surrounded by a layer of sand. Installation can be open trenching or by vibratory plowing.

The attenuation of Type **RX4-3A** for the TIS/HAR frequencies is 0.09 dB/100 ft (0.3 dB/100 m) at 530 kHz and 0.17 dB/100 ft (0.56 dB/100 m) at 1610 kHz. Typically, transmitters of 20 to 30 watts RF power are sufficient for desired signal coverage when used with Type **RX4-3A**. For AM broadcast frequencies, the performance of RADIAX cable buried at typical depths of 15-24 in (400-600 mm) can be simulated by temporarily laying the cable on the ground. The zone of coverage, therefore, can be confirmed before committing to permanent burial.

RADIAX IN RAILROAD TUNNEL

FIGURE 7 — TYPICAL BUILDING INSTALLATION



CALCULATIONS

The system operating margin can be calculated using known values for transmit power, receiver sensitivity, cable and RADIAX® attenuation loss, splitter insertion loss, and coupling loss. In addition, a 15 dB "system use factor" is treated as a loss to allow for other variables. Page 8 is a "System Design Sheet" for use in calculating the system operating margin.

The following relationships are used in the calculations:

$$\begin{bmatrix}\text{Operating}\\ \text{Margin, dB}\end{bmatrix} = \begin{bmatrix}\text{Received}\\ \text{Power, dBm}\end{bmatrix} - \begin{bmatrix}\text{Receiver}\\ \text{Sensitivity, dBm}\end{bmatrix}$$

where,

$$\begin{bmatrix}\text{Received}\\ \text{Power, dBm}\end{bmatrix} = \begin{bmatrix}\text{System}\\ \text{Gain, dBm}\end{bmatrix} - \begin{bmatrix}\text{System}\\ \text{Loss, dB}\end{bmatrix}$$

FIGURE 8 — CONVERSION TABLE

μv	dBm*	Watts	dBm
0.25	-119		
0.5	-113	0.5	27
1	-107	1	30
2	-101	2	33
5	- 93	5	37
10	- 87	10	40
		12	41
		15	42
		20	43
		30	45
		40	46
		50	47
		60	48

*For 50-ohm impedance

Example No. 1

Calculate the system operating margin of the typical tunnel installation using **RX4-1R**, operating at 150 MHz shown in Figure 6. The worst case situation is the talk-back from a portable receiver located midway between base stations.

Assume the following parameters:

30 dBm (1-watt)	Transmit Power
-107 dBm (1-μv)	Receiver Sensitivity
22 dB $\left(\frac{1.1 \text{ dB}}{100 \text{ ft}} \times 2000 \text{ ft}\right)$	RADIAX Cable Attenuation
75 dB	Coupling loss

Using the "System Design Sheet" from page 8, the system operating margin is calculated to be 22 dB.

	Gain (A)	Loss (B)
Transmitter Output, dBm	30	
Power Splitter Loss, dB		3
RADIAX Attenuation Loss, dB		22
RADIAX Coupling Loss, dB		75
System Use Factor, dB		15
Totals, dBm, dB	30	115

Received Power (A-B), dBm	-85
Receiver Sensitivity, dBm	-107
System Operating Margin, dB	22

Example No. 2

Calculate the system operating margin of the typical paging system using **RX4-3R**, operating at 150 MHz, shown in Figure 7. The worst case situation is the talk-back from a portable receiver located at the end of the terminated basement run.

Assume the following parameters:

30 dBm (1-watt)	Transmit Power
-87 dBm (10 μv)	Receiver Sensitivity
0.1 dB $\left(\frac{0.9 \text{ dB}}{100 \text{ ft}} \times 10 \text{ ft}\right)$	LDF4-50 Cable Attenuation
2.9 dB $\left(\frac{1.9 \text{ dB}}{100 \text{ ft}} \times 150 \text{ ft}\right)$	RADIAX Cable Attenuation

Using the "System Design Sheet" from page 8, the system operating margin is calculated to be 36 dB.

	Gain (A)	Loss (B)
Transmitter Output, dBm	30	
Power Splitter Loss, dB		6.0
Coaxial Cable Loss, dB		0.1
RADIAX Attenuation Loss, dB		2.9
RADIAX Coupling Loss, dB		57.0
System Use Factor, dB		15.0
Totals, dBm, dB	30	81.0

Received Power (A-B, dBm)	- 51
Receiver Sensitivity, dBm	- 87
System Operating Margin, dB	36

RADIAX® SLOTTED COAXIAL CABLE
SYSTEM DESIGN SHEET

NOMINAL ATTENUATION AND COUPLING LOSS

	RX4-1 and RX4-1R		RX4-2A and RX4-2R		RX4-3A and RX4-3R		RX5-1 and RX5-1R	
	Free Space	Concrete†	Free Space	Concrete†	Free Space	Concrete†	Free Space	Concrete†
Attenuation dB/100 ft (dB/100 m)								
30 MHz	0.45 (1.47)	0.45 (1.47)	0.50 (1.64)	0.50 (1.64)	0.9 (2.95)	0.9 (2.95)	0.24 (0.78)	0.24 (0.78)
150 MHz	1.1 (3.60)	1.1 (3.60)	1.3 (4.27)	1.4 (4.59)	1.9 (6.23)	4.0†† (13.1)	0.6 (1.96)	0.7 (2.29)
450 MHz	2.1 (6.89)	2.3 (7.54)	2.4 (7.87)	3.2 (10.50)	4.0 (13.12)	15.0†† (49.2)	1.2 (3.93)	1.5 (4.92)
900 MHz	3.2 (10.50)	4.1 (13.45)	3.6 (11.81)	6.4 (21.00)	6.0 (19.69)	30.0†† (98.4)	1.9 (6.23)	2.3 (7.55)
Coupling Loss at 20 ft (6.1 m) ± 10 dB								
30 MHz	85	85	80	80	77	77	95	95
150 MHz	75	75	67	67	57	57	70	70
450 MHz	85	85	75	75	61	61	80	80
900 MHz	82	82	74	74	68	68	80	80

† Mounted directly to concrete or other lossy surface.
†† Direct mounting of RX4-3A or RX4-3R to concrete is not recommended. Use Type 43042 standoff to achieve free space attenuation values.

	Gain (A)		Loss (B)
Transmitter Output,* dBm	______		
Coaxial Cable Loss, dB			______
Power Splitter Loss, dB			______
RADIAX Attenuation Loss, dB (See Above)			______
RADIAX Coupling Loss, dB (See Above)			______
Other Component Losses, dB			______
System Use Factor**, dB			______
TOTALS	______		______
Received Power (A-B), dBm		______	
Receiver Sensitivity,*** dBm		______	
System Operating Margin, dB		______	

For Reference:
*1 watt = 0 dBw = +30 dBm
**15 dB is recommended for a typical system.
***1 microvolt = −137 dBw = −107 dBm

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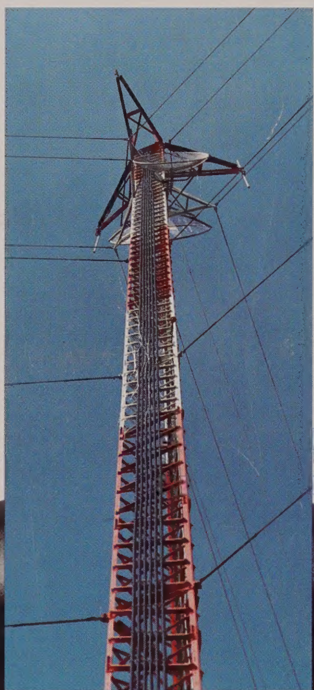

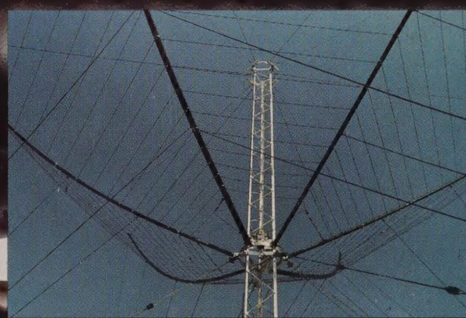

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